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SERVICE TALES

The Veteran and the Recruit

1817

BESIDE the fountains of Versailles he sat, that veteran of the Grand Army—sat and dreamed of service given and victories won for France and for Napoleon. The sunlight danced upon his silvered hair and upon the silvery spray of that ever falling water—water that ever changed but never failed—never failed because a century and a half before, in the days of Louis XIV, Cast Iron Pipe had been installed to serve those fountains.

As France has depended upon her children for service to "La Patrie," so have her children depended upon Cast Iron Pipe for service to "Les Grandes Eaux." The medal and the empty sleeve pinned to the breast of that veteran, and the silvery falling spray of those fountains, are alike visible proofs of service to France.

1917

BESIDE the fountains of Versailles he stood, that youth aflame with patriotic fire—stood enthralled by the beauty of those fountains which a century before had lighted the fading eyes of that veteran of Napoleonic wars.

A last lingering look at the falling water, and away to glorious service for France and for all mankind. Service to France—that faithful service rendered alike by the veteran of 1817, the recruit of 1917, and the Cast Iron Pipe of 1664.

Vive la France! Yes, and
Vive Le Conduit en Fonte!

THE CAST IRON PIPE PUBLICITY BUREAU

1 BROADWAY, NEW YORK

THE FIRST CAST IRON PIPE EVER MADE IN THE WORLDS HISTORY IS STILL IN SERVICE
SERVICE
CAST IRON PIPE
MEASURED BY
CAST IRON PIPE
CENTURIES
MORE THAN 250 YEARS OLD
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The Brick Sewer Basin Must Go

The matters of speedy garbage disposal and the elimination of the "dump" have been attended to long ago. Now the dangerous, disease dispensing brick, sewer catch basin at every street corner must go.

The Deplorable Condition

A big, brick sewer catch basin, built big to obviate frequent cleaning; filling slowly from week to week with a slimy, filthy, putrescent mass of semi-liquid mud, alive with disease germs; a periodic cleaning out of this loathsome mess, slopping it into the street and gutter and onto the sidewalk; carrying it miles thro' congested city streets to finally dump it openly, creating a further local menace. Is that sanitary engineering?

It is not right to have an open mouthed sewer basin at every corner polluting the atmosphere day and night and carrying disease throughout the community. Such an ever present epidemic breeder is not a proper sanitary condition and should not be allowed in a civilized environment.

The Positive Remedy

lies in the installation of Odorless Sewer Basins; a tested and proven proposition—not an idea in embryo. Conserve the health of your community by adopting thoroughly sanitary equipment.

Wherein The Odorless Excels

The Odorless Sewer Basin is made of pure cast iron, built to last forever; has a gas tight water trap that always seals against sewer gas or fetid emanations and can never freeze.

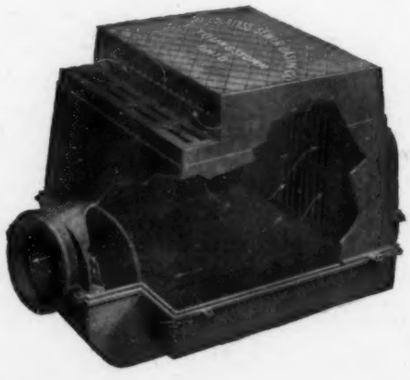
All rubbish is stopped, the sewer cannot become clogged, nothing can enter the sewer but fluid. The rubbish is thoroughly drained, every inflow of water further cleanses it, the material for removal is free from all contaminating properties; the Odorless absolutely eliminates the festering, foul, filthy mess of putrescence that is part and parcel of the brick basin.

The Odorless generates no contamination of its own, the interior surface is smooth, there is no place where gummy slimes can collect and form germ nests.

Odorless cleaning is simple—one man with a scoop removes the drained sediment quickly and cleanly.

The cost of installation is but little; one intelligent day laborer can excavate and set several daily.

Interesting literature describing the Odorless Basins thoroughly is gladly sent to those interested. Write for it.



The Odorless Sewer Basin Company

15 Wick Ave., Youngstown, O.

Municipal Journal

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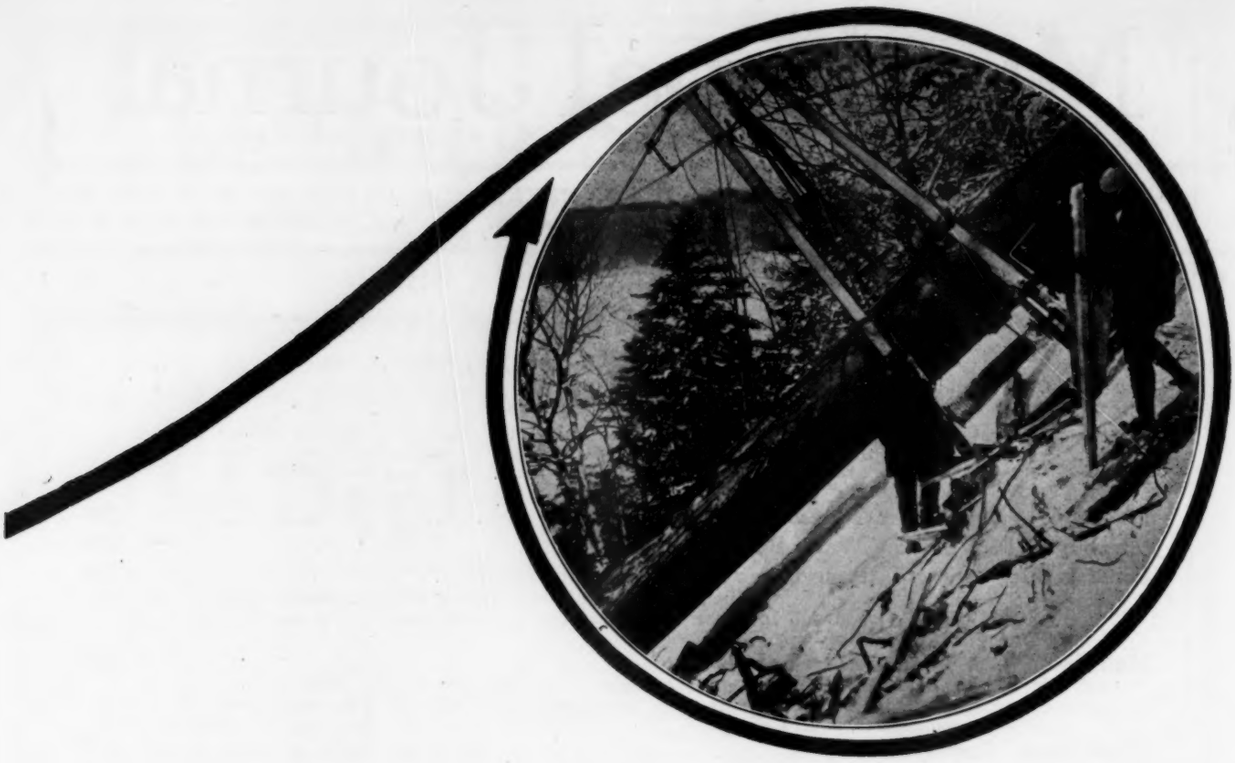

On one of the most difficult jobs in the East

LOCK BAR STEEL PIPE

Has Been Selected

While the pipe lies along a 45° slope, a 670-ft. head is met on the Silver Lake, Vermont, project.

The pipe that is best suited for this kind of a job is **Lock Bar Steel Pipe.** The joint develops 100% of the strength of the plate—giving excess security with the same weight of material.

The fact that Lock Bar Steel Pipe sections are 30 ft. long was of material aid, because fewer sections had to be placed on the steep slopes.

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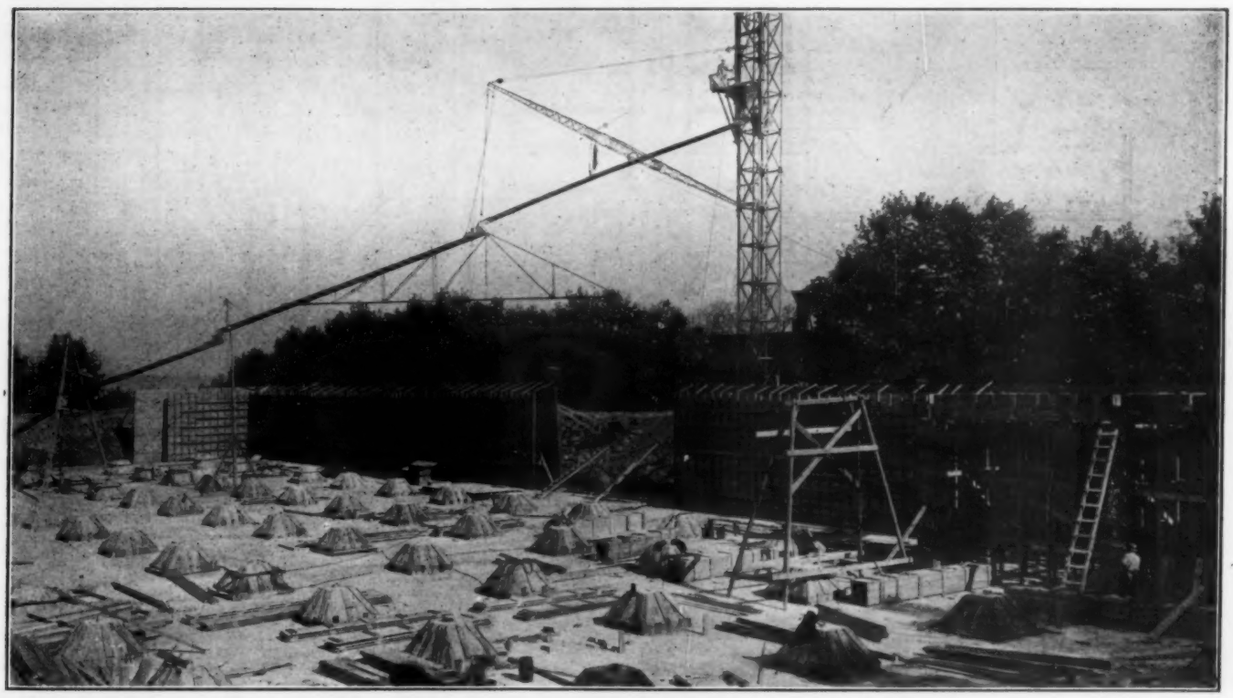
Municipal Journal

Volume XLIII NEW YORK, SEPTEMBER 6, 1917 No. 10

RECENT IMPROVEMENTS IN WILMINGTON'S WATER SUPPLY

Rapid Filtration Plant, with Turbine-Driven Centrifugal Pumps, Constructed to Supplement Slow Sand Filters, Both to be Operated Side by Side—New Filters of Twelve Million Gallons Capacity.

By EDGAR M. HOOPES, JR.*



WALL FORMS AND COLUMN FOOTINGS, RODNEY STREET RESERVOIR.

The first steps toward improving the water supply of Wilmington, Delaware, were taken in 1902 when the Board of Water Commissioners adopted a program for completely rebuilding the plant at an expenditure of about $1,500,000.

The improvements did not contemplate any change in the source of supply, which since 1827 had been the historic Brandywine creek. Originating in the lower counties of Pennsylvania, this stream has a total length of about 35 miles and a drainage area of 335 square miles above the city of Wilmington. Owing to the number of towns and villages, together with various classes of manufacturing plants located on the water shed, the water is contaminated with both sewage and trade wastes to a marked degree. No efforts at purification were attempted until 1892, when a Sellers filter was installed, and this, until the advent of bacteriology, was supposed to be giving excellent results. The Sellers sand filter, which was of the upward type, marks one of the early efforts in the use of iron as a coagulent.

*Chief engineer, Water Department, of Wilmington, Del.

Following the repeated appearance of typhoid epidemics and a more general appreciation of the dangers of the source of supply, a new and more adequate plant was authorized in 1904. Five years later the following principal structures had been completed and placed in operation:

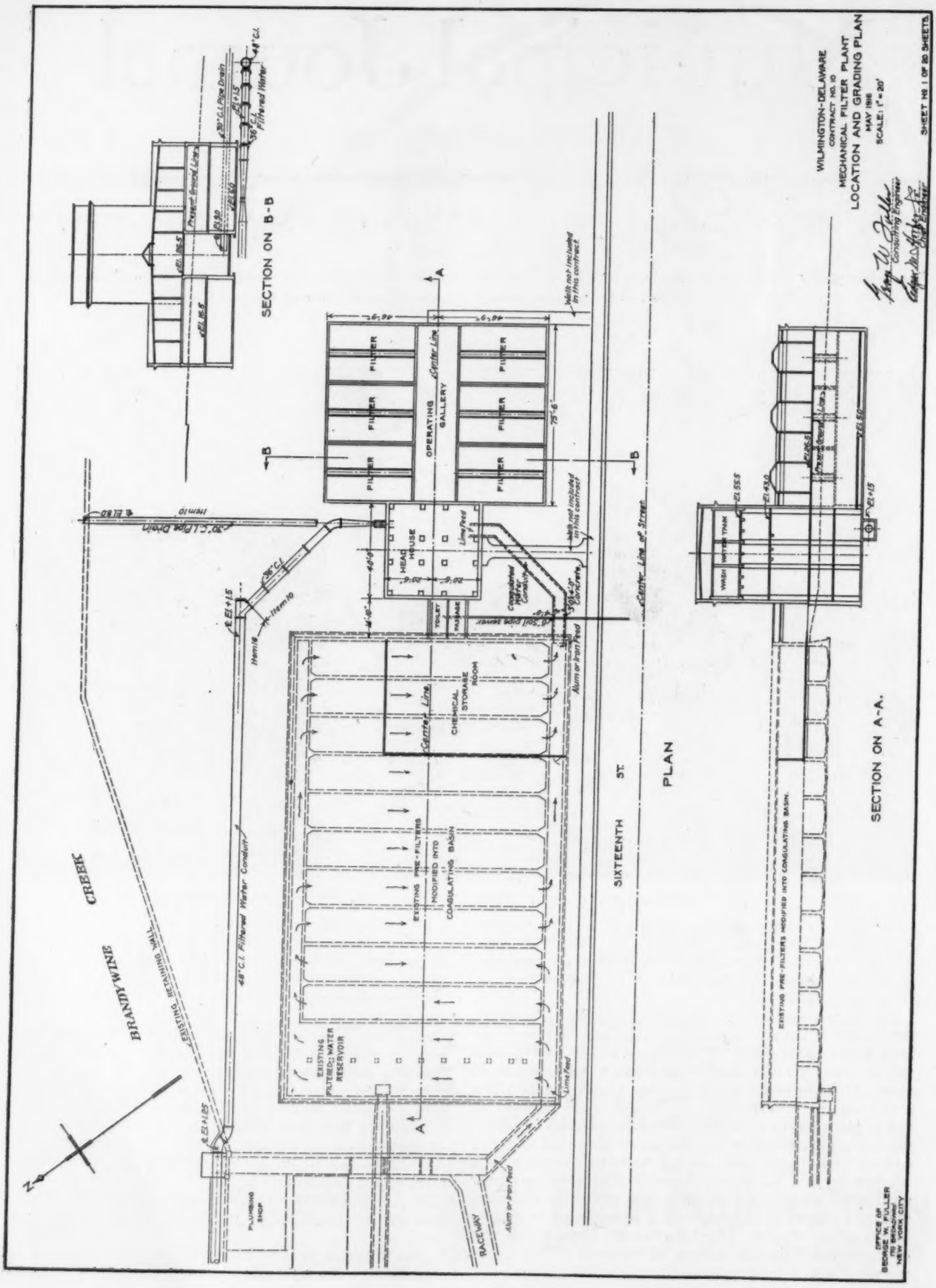
a—A new pumping station, including boiler house and coal bunkers with two 12-million-gallon high-lift Holly pumping engines, and four 200 h.p. Edgemoor boilers.

b—Preliminary or scrubber filters of the Maignen type, with a nominal capacity of 15 million gallons daily. The direction of filtration in these filters is upwards and the filtering media are coke, gravel and sponge clippings.

c—19,500 feet of 42 and 48-inch lock-bar steel pipe as forcing and distributing mains.

d—A sedimentation basin (Porter reservoir) of 35 million gallons capacity, of which 32 million gallons are available.

e—Two acres of covered slow sand filters arranged in six beds of equal area, and cleaned hydraulically by means of a Blaisdell machine.


WILMINGTON-DELAWARE
CONTRACT NO. 10
MECHANICAL FILTER PLANT
LOCATION AND GRADING PLAN
MAY 1915
SCALE: 1" = 20'
SHEET NO. 1 OF 20 SHEETS.
SECTION ON B-B
SECTION ON A-A.
PLAN
SIXTEENTH ST.
BRANDYWINE CREEK
EXISTING RETAINING WALL
48" C.I. Filtered Water Conduit
EXISTING FILTERED WATER RESERVOIR
EXISTING PRE-FILTERS MODIFIED INTO COAGULATING BASIN
CHEMICAL STORAGE ROOM
OPERATING GALLERY
FILTER
HEAD HOUSE
PLUMBING SHOP
RACEWAY
Lime Feed
Alum or Iron Feed
Center Line
Center Line of Street
Items not included in this contract
WASH WATER TANK
EL. 555
EL. 430
EL. 415
EL. 350
EL. 185
EL. 180
EL. 165
EL. 150
Present Ground Line
30" C.I. Pipe Drain
48" C.I. Filtered Water
OFFICE OF GEORGE W. FULLER 170 BROADWAY NEW YORK CITY

f—A groined arch, filtered water reservoir of six million gallons capacity. The reservoir is located directly under the slow sand filters; the roof of the former serving as the floor of the filter beds.

Operation of the Plant.—Water is taken from the Brandywine creek at a dam located about one mile from the plant and flows by gravity through a canal or race to the preliminary filters. From the preliminary filters the water is conducted by gravity to the pumps, where it is raised to the sedimentation basin at an elevation of 285 feet above the pumps. From the sedimentation basin water flows by gravity to the slow sand filters and thence to the filtered water reservoir directly underneath. The city is supplied directly from this reservoir and is divided into three pressure zones; one of which requires repumping and one is supplied at a reduced pressure by means of a compensating reservoir of 40 million gallons capacity.

For the first two years of its operation the new plant gave entirely satisfactory results—both as regards sanitary quality of the water and operating costs. With the beginning of the third year, however, operating difficulties of a serious nature developed at the slow sand filters. Shrinkage cracks in the unreinforced concrete floors of the filters (which also serve as the roof of the filtered water reservoir) appeared in large numbers. The cracks extended longitudinally the full length of each bed at points midway between supporting piers and laterally as well. During periods of low temperature these cracks would open up, permitting most of the water to pass directly to the filtered water reservoir underneath, instead of taking the intended route through the underdrain and collector system. At such times the rate of filtration in the area over the cracks would be excessive and entirely beyond the control of the operator.

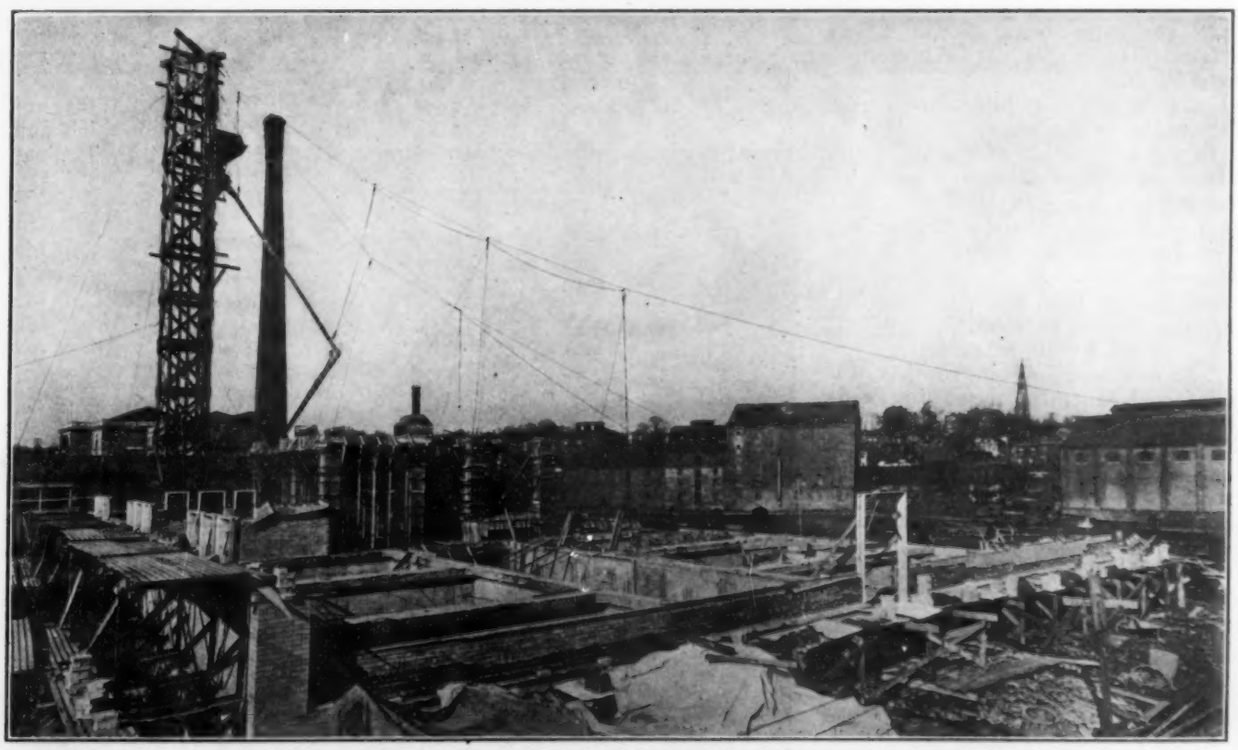
It also became evident that the preliminary treatment given the water did not adequately prepare it for slow sand filtration. The effect of removing the coarser suspended matter by the preliminary filters prior to sedimentation was to largely defeat the latter action at the sedimentation basin and to leave a very fine turbidity to be removed by the slow sand filters.

The behavior of these filters with applied water containing very fine clay particles was remarkable, but eventually there occurred a penetration of this material to the lower portions of the sand layer beyond the reach of the Blaisdell washing machine. This condition, combined with the structural defects before noted, reduced the yield of the filters greatly and caused high initial losses of head through both leakage and clogging.

The effect of operating the Wilmington filters under a negative head, or even the loss of head exceeded the depth of water on the bed, was to produce "air binding" to an extent which frequently prevented the passage of water through the beds. This was particularly true during the winter months when operating with negative heads in excess of eighteen inches—a condition which frequently occurred in those beds where leakage was excessive. The air binding in filters of either the mechanical or slow sand types is due to the production of a vacuum below the plane of greatest frictional resistance when the filters are operated under negative heads. Under such conditions air is not only released from the water in process of filtration, but will be drawn in from the outside unless the filter structure itself is tight. At the Wilmington filters air binding occurred from both sources.

Mr. Fuller's Report.—Such was the situation in 1915 when the Board of Water Commissioners was concerned not only with remedial measures but also with enlargement of the entire plant in order to keep pace with the rapid growth of the city. As radical changes in policy were indicated, it was decided to have a careful study made of the filtration needs as well as a report on future improvements. For this purpose the services of George W. Fuller, consulting engineer, New York City, were engaged and preliminary work at once inaugurated.

After a careful study of turbidity records, operating statistics and other pertinent data, Mr. Fuller reached



FILTER TANKS AND HEAD HOUSE FOUNDATION UNDER CONSTRUCTION.

the conclusion that it would not be practicable to lessen adequately the turbidity of the applied Brandywine water without the use of a coagulent. He further found that the existing slow sand filters were seriously overtaxed and in need of structural repairs; that the capacity of the main pumping station should be increased and that storage facilities for filtered water were unsatisfactory as regards capacity, location and elevation. The acquisition of additional water rights in the Brandywine was recommended and the possibilities of interruption to the existing filtered water supply, through breaks in the principal forcing and distributing pipes, carefully emphasized. Mr. Fuller found that the slow sand filters had made a surprisingly good record in the removal of clay, and that, with proper treatment of the applied water, excellent results might be predicted for the future.

Three principal filtration projects, together with other betterments, are included in Mr. Fuller's report and may be briefly summarized as follows:

Project No. 1: A duplication of the present slow sand filters at an adjoining site.

Project No. 2: A 12-million gallon rapid sand filter plant adjoining the present slow sand filters.

Project No. 3: A 12-million gallon rapid sand filter plant adjoining and making use of the present preliminary filter plant structures.

As the last project was the lowest in first cost as well as in operating expense, it received the immediate approval of the Board of Water Commissioners upon Mr. Fuller's recommendation. The estimated cost of the improvements was $750,000, and included the following items:

1. A new rapid sand filter plant with coagulating facilities of 12 m.g.d. capacity.
2. A new covered filtered water reservoir of 7.5 million gallons capacity.
3. Piping connections from the new filters to one of the existing Holly pumps and to three new centrifugal pumps to be installed.
4. New forcing mains and connections where required.
5. Repairs to present slow sand filters.
6. Baffles in existing sedimentation basin near slow sand filters.
7. Purchase of additional water rights up to the full flow of the Brandywine.

In the preparation of plans and specifications for the above work Mr. Fuller was assisted by his partner, James H. McClintock, Elmer G. Manahan and the Engineering Department of the Board of Water Commissioners. At the start of the work in June, 1916, Elmer G. Manahan became resident engineer.

NEW RAPID FILTERS.

The new filter building consists of a reinforced concrete substructure, containing the filtered water reservoir and filter tanks, with brick superstructure and headhouse. Slab and beam construction with concrete columns was substituted for the conventional groined arch treatment in the roof of the reservoir supporting the filter tanks. The filters, of which there are six, are grouped three on each side of a central pipe gallery, which contains the coagulated water conduit and wash water line, each of concrete, a 20-inch cast iron wash-water line, and 20 and 14-inch cast iron effluent pipes from each filter.

The roof of the pipe gallery serves as the operating platform supporting the operating stands and gauges. All valves are hydraulically operated, but stands were substituted for operating tables. The rate controllers and loss-of-head gauges are Builders Iron Foundry make.

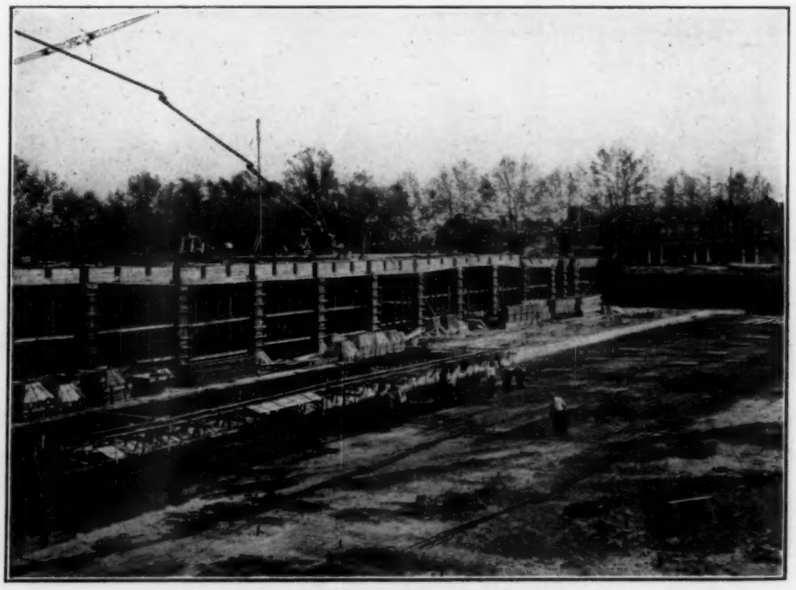
Each filter unit is grouped around a central gutter, the beds being 20 feet 6 inches by 36 feet, equivalent to 738 square feet in area. The effective depth of beds is 8 feet 6 inches. The filtering media consist of 18 inches of gravel in five courses, ranging in size from that passing a 2½-inch screen to that passing a 3/16-inch screen, and 24 inches of sand with an effective size of .67 mm. and uniformity coefficient of 1.19.

The strainer system consists of cast iron floor castings bolted to the effluent piping and cast in the concrete floor of the filter beds. The strainer manifolds are bolted to these floor castings, there being two center manifolds to each bed with 1¾-inch cast iron pipe laterals. The laterals are 4 feet 6 inches long, with two rows of ¼-inch holes (nine holes to a row), drilled and set at an angle of 30 degrees with the vertical axis of the pipe. The joints between the laterals and manifolds are caulked, as are also the lateral caps. The strainer system serves to apply the wash water. The wash water gutters are of reinforced concrete and arranged six to each bed on either side of the central gutter.

The capacity of the filtered water reservoir under the filters is 450,000 gallons. A 48-inch cast iron main connects this reservoir with the suction well of the new pumps. The installation of this line, part of which is below mean low tide in the Brandywine, was one of the most difficult tasks connected with the work.

In the headhouse are contained the alum mixing boxes and solution tanks. Lime slakers and lime solution tanks are also provided, all tanks having motor-driven stirrers. Orifice boxes and eductors are located on the first floor of the headhouse, from which the solution is piped to three different points of application. A proportionally controlled liquid chlorine apparatus is also located on the first floor, the control being regulated by Venturi meter installed on the filtered water line connecting the reservoir with the pumps.

The wash-water tank, which is located on the top floor of the headhouse, is waterproofed with a felt and pitch membrane supported by a brick lining. The ca-



COLUMN AND ROOF FORMS, RODNEY ST. RESERVOIR.

pacity of the tank is 81,500 gallons. The tank is filled with filtered water from a high pressure line connected with the distribution system. The overflow of the wash-water tank is located at elevation 66, while that of the bottom of the filters is 16.5. The tank is supported by twelve 20-inch by 22-inch reinforced concrete columns forming the framework of the headhouse, with four 20-inch by 20-inch columns carried up on a 10-foot square through the center of the building. The principal girders are two in number, 18-inch by 36-inch, of reinforced concrete with two spans of 11 feet 4 inches and one of 8 feet 4 inches. The spacing is 13 feet from the center of the outside columns to the center of the girders. Secondary girders are 12-inch by 30-inch of reinforced concrete on 4-feet 6-inch centers, with two spans of 13 feet and one of 10 feet. The construction of the headhouse and wash-water tank was an interesting and difficult phase of the contract. The inside dimensions of the tank are 35.5 feet by 35.5 feet by 10.5 feet.

OPERATION OF THE NEW FILTERS.

The contract for the new filters was awarded in May, 1916, to the Roberts Filter Manufacturing Company, of Darby, Pa. The engineer for the contractor was D. G. Abeel. The principal sub-contractor was J. S. Rogers Company, of Moorestown, N. J. While the contract was let on a unit price basis, the cost, based on the engineer's estimates of quantities, was $154,100. The filters were completed and placed in operation in June, 1917, and the final estimate indicates that the estimated cost will be very slightly exceeded.

The filters have been operated since placed in service at a rate of 2 gallons per square foot per minute, equivalent to 2,000,000 gallons per day per unit. It is confidently expected that a rate of 3 gallons per square foot per minute can be obtained and maintained over a reasonable period of time with good initial quality of water. For turbidities under 40 p.p.m., 6/10 of one grain of alum per gallon has been found sufficient to properly coagulate the raw water. Turbidities requiring three to four grains per gallon have been encountered also, thus showing the wide range in operating conditions.

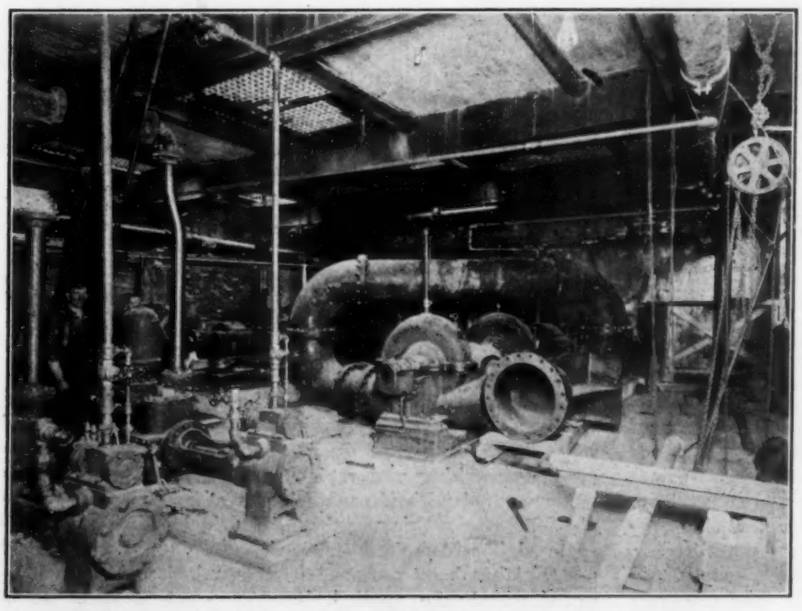
The average quantity of wash water employed has been 40,000 gallons for each wash, or approximately 2 per cent of the filter unit yield. The velocity of wash water with control valve open is 2.7 feet per minute, resulting in very good suspension of sand and no lifting action on the gravel. The sanitary quality of the filtrate after the first few weeks of operation has been excellent.

NEW COAGULATING BASIN.

The new coagulating basin, which was a part of the filter contract, was constructed by altering the old preliminary filters which immediately adjoin the new filters. The beds of this filter are 14 feet 5 inches by 100 feet 8 inches and are ten in number. In addition, there is a clear water basin at the same elevation as the filter beds of 31 feet by 100 feet 8 inches. The filtering media of sponge, gravel and coke were removed from the beds, inlet and outlet wiers constructed at the ends and the necessary sluice gates installed for properly controlling the direction and volume of flow. The coagulent is applied just before the raw water enters the building and the flow diverted through the first two beds and clear well. Passing from these beds, the water enters a concrete conduit and travels thence back through the seven remaining beds at a greatly reduced velocity. Passing over the outlet wiers at the ends of these beds, the water flows directly to the new filters through a second concrete conduit. The period of retention in the coagulating basin varies from 45 to 60 minutes, but rapid flocculation occurs owing to the agitation of the water in passing through the first two beds and clear water well. The entire arrangement is exceedingly satisfactory and places to good use a structure which otherwise would soon have been discarded. A chemical storage house has been constructed over the three end beds of the basin and this is in turn connected with the headhouse by a short runway. A hydraulic elevator in the headhouse makes the handling of chemicals a matter of great convenience.

NEW TURBINE-DRIVEN CENTRIFUGAL PUMPS.

In September, 1916, a contract was awarded the Dravo-Doyle Company, of Philadelphia, Pa., for two 9 million gallon and one 12 million gallon DeLaval centrifugal pumps and turbines. The smaller units were to operate against a maximum head, including friction and suction heads, of 150 feet, and the larger unit against a maximum head of 290 feet. The contract price was $64,900 for the three units with condensors, combined wet and dry vacuum pumps, feed-water heater and two boiler-feed pumps. Operating conditions were 150 pounds steam pressure, with 30 degrees of superheat and a 28-inch absolute vacuum with condensing water at 75 degrees F. The manufacturer's duty guarantee on the large unit was 123.8 million foot-pounds per thousand pounds of dry steam, and on the smaller units 110.8 million foot-pounds. For the purpose of comparing bids, the highest duty guarantees were taken as a basis and the sum of $200 for each of the smaller units and $400 for the larger units, added to the lower bids for each million foot-pounds' difference in duty between the lower guarantee and the base guarantees. While maximum operating heads were given in the specifications, units with a high efficiency over a wide range of head were desired, and the bidder was required to guarantee the duties under minimum and average operating heads.



INTERIOR OF PUMP ROOM, SHOWING PUMPS AND TURBINES.

An outline of the installation is as follows: All main pumping units were to receive their suction under a suction lift of from 5 to 15 feet, depending

on the elevation of water in the suction well. Condensers were located on the suction side of the pumps in such a way that the circulating water for each condenser should be the suction supply for its main pumping unit. The condensate or tail pumps were to discharge the condensate into the open feed-water heater—the latter being located sufficiently above the turbine roof floor to permit the boiler feed pumps to receive their suction under a pressure head. Steam exhausts from the auxiliary pumps and boiler feed pumps were to be discharged directly into the open feed-water heater. The units mentioned have been installed and in operation in connection with the new filters since June of this year. They are used both for direct pumpage into the mains and for filling storage reservoirs.

While tests for acceptance have not as yet been conducted, the results of two months' operation indicate that the duty guarantees will be exceeded. It may be of interest to note that the 12 million gallon pump consists of two 18-inch double-suction pumps arranged in series. The speed of these pumps is 1,060 r.p.m., requiring 765 brake h.p. at the turbine. The turbine speed is 5,000 r.p.m., the ratio of speed reduction between turbine and pump being 4.72 to 1.

The smaller units are each 16-inch double-suction, single-stage pumps, operating at 1,200 r.p.m., and requiring 280 brake h.p. at the turbines. The speed of

VIEW OF A FILTER STRAINER.
Openings for Troughs Are Seen in the Side Walls.

the latter is 5,000 r.p.m. and the reduction ratio is 4.17 to 1. A reduction gear efficiency of 98½ per cent is guaranteed by the manufacturer. Wheeler-Edwards combined wet and dry vacuum pumps, Wheeler Condenser & Engineering Company's water-works condensers, and a Cochrane feed-water heater complete the installation. Builders Iron Foundry Company Venturi meters and recorders are installed on the discharge lines.

NEW FILTERED WATER RESERVOIR.

The contract for the reservoir was awarded in June, 1916, to Williams & Kinnamon, general contractors, of Baltimore, Md. Based on the engineer's estimates of quantities, the cost of the structure under the unit prices bid will be $134,800. Progress on the work has been delayed owing to unforeseen difficulties, and in September, 1916, the principal contractors were permitted to sublet the remainder of the work to the Consolidated Engineering Company, of Baltimore, Md. The reservoir is of reinforced concrete with covered top supporting earth fill, asphalt skating rink for children, and band stand. The dimensions are 249 feet by 268.5 feet by 15 feet, and capacity 7,500,000 gallons. In the design of the reservoir roof, slab and beam construction was again selected as against groined arches. The supporting columns are 21 inches by 21 inches square, spaced on 18-foot centers. The footings of the columns are spread to a 4-foot 9-inch square, 2 feet 3 inches high and 2 feet by 2 feet on top. Main girders are 18 inches by 32 inches, reinforced top and bottom, spaced on 18-foot centers, and secondary girders are 12 inches by 20 inches, spaced on 6-foot centers. The slabs are reinforced in both directions and are supported on four sides, the span either way being a distance of 6 feet. Originally, the slab thickness was 4 inches, but, owing to the difficulty of completely covering the steel, as well as in the interests of watertightness, the thickness was increased to 6 inches. A reinforced concrete division wall runs the length of the reservoir, dividing it into two equal compartments for cleaning or repair. The elevation of the flow line of the reservoir when full is 243, while the area it is to serve is already supplied by the reservoir under the slow sand filters at elevation 255.5. In order to place the two reservoirs in proper hydraulic relationship, the gate house of the new unit is supplied with standpipes which control the discharge into the reservoir at three different elevations. The minimum of these corresponds to the bottom of the reservoir under the slow sand filter, and the maximum to the flow line when the same reservoir is full. When pumping filtered water directly into the mains, the surplus can be allowed to back up directly into the reservoir under the slow sand filters, or into the new reservoir, without affecting the pressure in the area supplied, by operating the proper standpipe valves. For the present, the discharge lines from the new reservoir will be controlled by check valves which will open only when the hydraulic grade line between the two reservoirs is sufficiently lowered by heavy draft. To provide proper circulation of water, a small line is extended from the new reservoir at elevation 243 to a low-service compensating reservoir a few blocks away at elevation 145. Eventually a fourth pressure zone will be established which will be supplied directly from the new reservoir. Until that time, its principal value will be the storage of filtered water at adequate elevation within a very congested and important area.

The treatment of the roof of the reservoir by constructing a skating rink and band stand has struck a popular note in the community. The walls of the reservoir are 3 feet 6 inches at the base by 17 feet 9 inches high by 2 feet wide at the top. The earth embankment around the walls was considered an element in designing the reservoir, to resist the water pressure when filled. The portion of the reservoir roof not used for the skating rink (about two-thirds of the total area) will be covered with a 20-inch earth fill and placed in grass. The total volume of earth removed in excavating for the reservoir was about 22,000 cubic yards, of which amount over half will be required for embankments.

OTHER PLANT IMPROVEMENTS.

At the slow sand filters the work of removing the filter media and waterproofing the leaking filter floors is well under way. This project requires the removal of some 10,000 cubic yards of sand and gravel with the grading, washing and replacing thereof. The beds are waterproofed with alternate layers of asphalt and three-ply felt. Over this membrane a 3-inch reinforced concrete slab will be constructed. To date, the filtering material has been removed from one bed and the waterproof membrane applied, but no concrete laid. It is hoped that at least three of the six beds, which are 40

by 362 feet each, may be repaired before extreme cold weather.

The baffling of Porter reservoir, which is the sedimentation basin for the slow sand filters, will not be attempted until next spring. By that time Wilmington will find itself in the unique position of operating side by side two excellent filter plants, one slow sand and the other mechanical. The operating results to be obtained will be awaited with much interest.

With the aid of an adequate engineering organization and the hearty support of the community, the supply portion of the Wilmington water works has been slightly more than doubled within one year. George W. Fuller and James R. McClintock have remained as consulting engineers throughout the work.

WALTHAM WATER WORKS NOTES

Preparing Comprehensive Plans of System—Progressive Metering Reduces Waste—Action of Water on Brass Pipes—Maintenance of Hydrants and Gates.

The water works of the city of Waltham, Mass., were placed under the charge of the city engineer in 1915. In the report for the year ending January 31, 1917, of city engineer Bertram Brewer, appear a number of interesting items concerning the operation of the plant during the previous year.

He states that no comprehensive plans of the system of water mains and services were ever made, but when the system was turned over to his charge he began the task of reducing such data as were available to some kind of logical shape and to gradually complete a plan of the entire system. Plans of the old work are well under way, and all new work is plotted and placed on record as an essential part of his routine work. Incidentally it may be said in this connection that the city engineer gets out an up-to-date atlas of most of the city every few years, which he believes is probably done by no other city in the country. This atlas is used by all the city departments and by many individuals and corporations.

Since 1912, the percentage of services metered has been continually increased, until at the time of this latest report it amounted to 53 per cent. At the same time, and undoubtedly as a result of this, the waste of water has decreased. The per cent of services metered and the average per capita rate of use or waste of water between the hours of 1 and 4 A. M. during the past five years have been as follows:

Year	Per cent. of Services Metered.	Consumption bet. 1 and 4 A. M.
1912	18½	61.3
1913	25	62
1914	34	51
1915	43	45.3
1916	53	43.7

A waste of even 43.7 gallons per capita per day is considered by Mr. Brewer to be altogether too high and to point to the necessity for a careful investigation into sources of waste in the entire system.

For some time it has been realized that the water supply of Waltham has a very noticeable effect on brass, brass piping in many cases having been completely destroyed in a comparatively short time. The city engineer last year asked the State Department of Health for advice in the matter, and a state chemist was sent to the city to make field analyses and ascertain the cause of this action of the water. Analyses were made to determine the amount of dissolved oxygen, of carbonic acid, and of alkalinity. It was learned that there was an unusual amount of free carbonic acid present, amounting to 2.86 parts at one station and 3.16 at the other. (The supply of Waltham is obtained from wells at two pumping stations.) The citizens were assured that this acid would have no injurious effect upon the human system, it being the same material that is used in soft drinks at soda fountains and in various bottled waters in very much larger quantities than it is found in the city water. The State Health Department advised against using lead or brass pipes for service pipes with this water, and stated that galvanized iron pipes also would be acted upon seriously by the water, the coating probably being dissolved within a short time. The carbonic acid can be removed by aeration and filtration, but this would involve a large outlay for new works and increased annual maintenance expenses for operation. Brookline was cited in this connection as having recently spent $200,000 for such aeration and filtration works.

Commendable attention is paid to the hydrants and gates of the system, nearly all of which were tested twice during the year. Attention, however, was called to the fact that there is carelessness in the use of the hydrants, the emergency man having been called out frequently to repair leaking hydrants only to find that it was merely a case of carelessness on the part of the user in shutting off the hydrant. In this connection Mr. Brewer suggests that it would be a good plan to have the Police Department informed about the details of the water works and other property of the city, the proper names of the different fixtures, and what city official is in charge of each; and he suggests that he would be glad to give special information of this kind to the Police Department from time to time.

FORESTRY BY NEW BRITAIN WATER BOARD.

Forestry of their water sheds is becoming more general with municipal water works plants in New England, and New Britain, Conn., offers a good illustration of such work being done in an unpretentious but effective way.

Re-forestration of the water sheds of this city was begun in 1916, when 10,000 red and white pines were set out on the east side of Shuttle Meadow Reservoir. The total cost was a little less than $14 a thousand. While authorities agree that, in that section of country at least, white pine is the best tree for this purpose, owing to the prevalence of the white pine blister rust in New England it was thought best in planting to alternate the white with the red pine, so that should the white pine fail there would still be enough red pine. The white pine trees were placed 6 feet apart. In its report for the year ending March 31, 1917, the board stated that both species are doing much better than it had expected, the total loss from all causes being less than 5 per cent.

"As an economic necessity, and in the application of true conservation and practical care of our various water sheds, the wisdom of re-forestration of the same cannot be questioned.

"In Burlington alone the city of New Britain is owner of over 2,000 acres of land. In the forest area of this large tract the chestnut tree blight killed almost all of the chestnut trees, which have been sold on the stump and are now being cut down, and as this species was the principal growth in most sections, it leaves this land denuded and unsightly. As soon as the lumber people get through we will begin to re-forest same."

The receipts for the year show that $659 was obtained from the sale of wood from the Burlington and Shuttle Meadow tracts, and that $167.91 was expended for trees and labor in the forestry work at Shuttle Meadow.

LANSING CONCRETE RESERVOIRS.

Novel Details in Design and Construction Methods—Distributing Concrete without Use of Tower and Chutes—Beam and Girder Roof.

By F. G. GORDON.*

Two 3,500,000 gallon reservoirs now under construction for the city of Lansing, Mich., present some unusual features, both in the design and in the contractor's plant for handling the work.

Each of the two reservoirs is 155 ft. inside diameter and 160 ft. outside diameter. The reservoirs are placed 12 ft. apart in the clear. The ground elevation varies from 94 to 113, which is the approximate elevation of the sidewalk of Cedar street which passes about 100 feet from the nearest points of the two reservoirs. The roof of the reservoir is at elevation 116.5, or a little higher than the Cedar street sidewalk. The bottom of the reservoir slopes from an elevation of 89.0 at the center to 92.0 at the circumference. On each end of one of the diameters is located a cleanout door, and leading from one of these is a vertical ladder to the bottom of the reservoir.

Water enters each reservoir through a 16-inch pipe which passes through the wall at elevation 110 and immediately inside the wall drops to the bottom of the reservoir, where there is a 90 degree bend. The portion passing through the wall is provided with a wall-spool made by casting a ¾-inch by 3½-inch fin on a standard sleeve in order to provide water-tight bond between pipe and wall. Inside each reservoir was placed an overflow pipe, composed of two lengths of 12-inch pipe, at the top of which is a funnel of ¼-inch steel plate riveted to a piece of 12-inch wrought iron pipe 17-inches long which is calked into the bell of the vertical overflow pipe. The top of this funnel is at elevation 115.5.

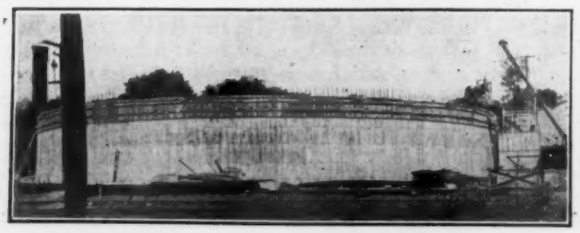
Each reservoir wall is designed as a ring. Three-inch channels spaced approximately 8 feet on centers are used to support the reinforcing steel. Three sizes of bars were used in this reinforcing; ¾-inch, 1-inch and 1¼ inches. After careful consideration of the various types of roof construction, the flat slab roof was decided upon. This is somewhat of a departure from past custom in reservoir designs and, so far as the writer knows, is the first instance of its having been employed. The roof is a 7½-inch slab supported by circular columns spaced eighteen feet center to center. The floor of each reservoir is six inches thick and is reinforced both ways to take care of temperature stresses. A tar and felt construction and expansion joint is employed at the juncture of the wall and the floor and around each one of the column bases. A valve vault located between the two reservoirs gives control to the inlet, outlet and overflow pipes.

The bottom is reinforced with ½-inch bars placed 12 inches between centers both ways. Under each column footing is placed a foundation block of concrete 8 ft. square. The concrete floor is placed on top of these footings with expansion joints between the bottom of the floor and the top of the foundation. There are also expansion joints in the floor around each footing and 12 inches from sides of the same.

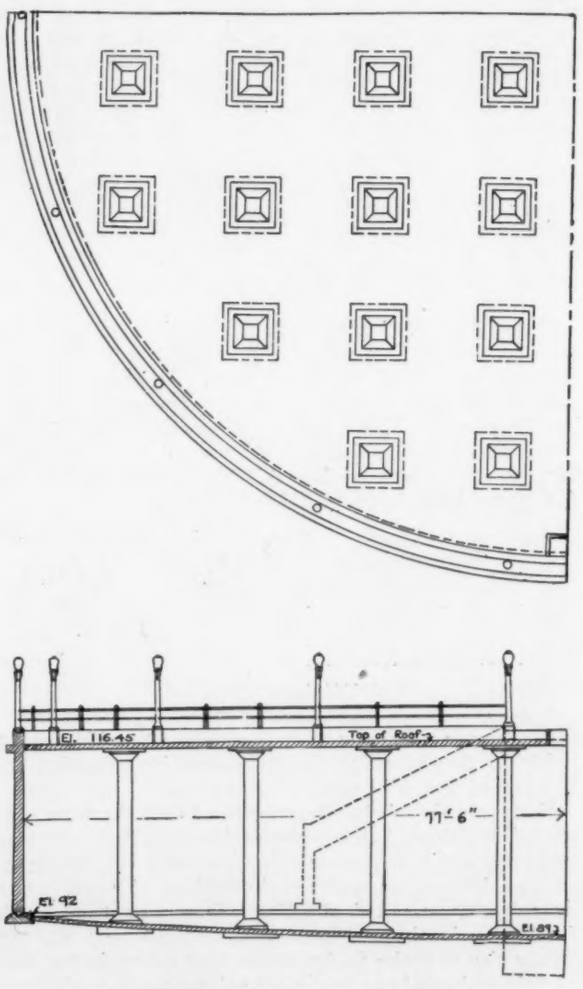
On one side of each reservoir is a stairway, with steps having 12-inch tread and 6-inch rise, and 6 ft. long. These and the supporting girders are of reinforced concrete, and a pipe railing is provided along each side of the stairway. This stairway descends to elevation 104.

The reservoirs are being built on a lot approximately 350 feet long and 290 feet wide. The back of the lot, which is adjacent to a railroad siding, is much lower than the front, so advantage was taken of this fact to locate the reservoirs so that the excavated material could be used in grading up to, and over their tops. An ornamental railing with light posts extends around the back half of each reservoir. When the grading has been completed shrubs and flowers will be planted and the lot will be converted into a small city park. Although the location of the reservoirs at the back of the lot was particularly desirable from the standpoint of the finished work, it occasioned the contractor trouble in disposing of his excavation and in handling his materials. The excavation was done by means of a drag-line excavator attached to a sixty-foot movable boom. The earth was dumped into a hopper on the high ground to the east of the excavation and was carried from there on an industrial rail-

*Assistant engineer to Dabney H. Maury, consulting engineer, Chicago.



ONE TANK NEARING COMPLETION.

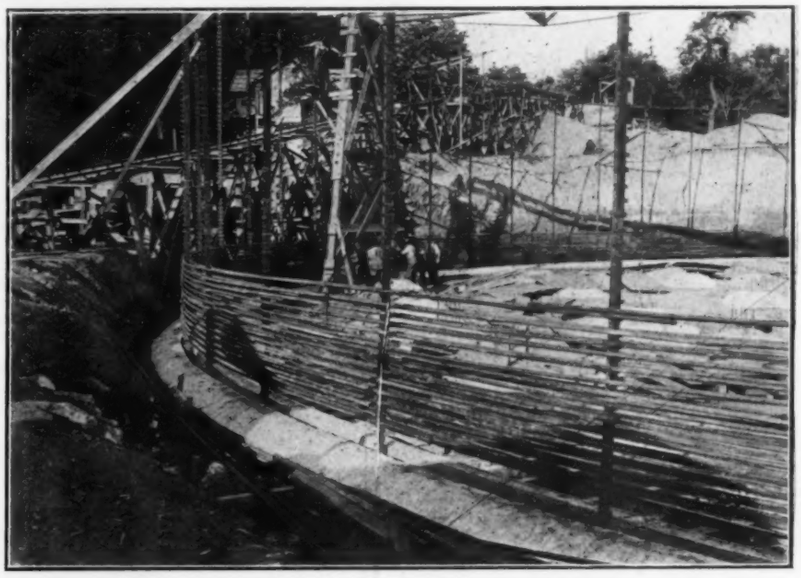


QUARTER PLAN AND HALF SECTION.

way to the top of the dump pile. A rather novel method was used to break up a number of brick and concrete foundations which were encountered in excavating. A drop ball was procured from a local foundry and this was dropped from a height of twenty to thirty feet onto the foundation to be shattered. This method proved so effective that it entirely displaced the use of explosives.

The contractor decided, in arranging his plant for pouring concrete, to dispense with manual labor wherever possible. Sand, gravel and cement are carried from the car to a point at the front of the lot by means of an inclined railway. This railway is extended on a trestle over the sand and gravel supply piles which are adjacent. Between these piles a hopper has been installed in a pit over a railway running to the mixer. Wooden bulkheads allow the sand and gravel to be piled up on each side of the pit. The hopper is divided into two compartments, one holding the required amount of sand for a batch and the other the necessary quantity of gravel. The hopper is filled with sand and gravel, struck off; the requisite amount of cement is added; and the whole dumped into a car on the track below.

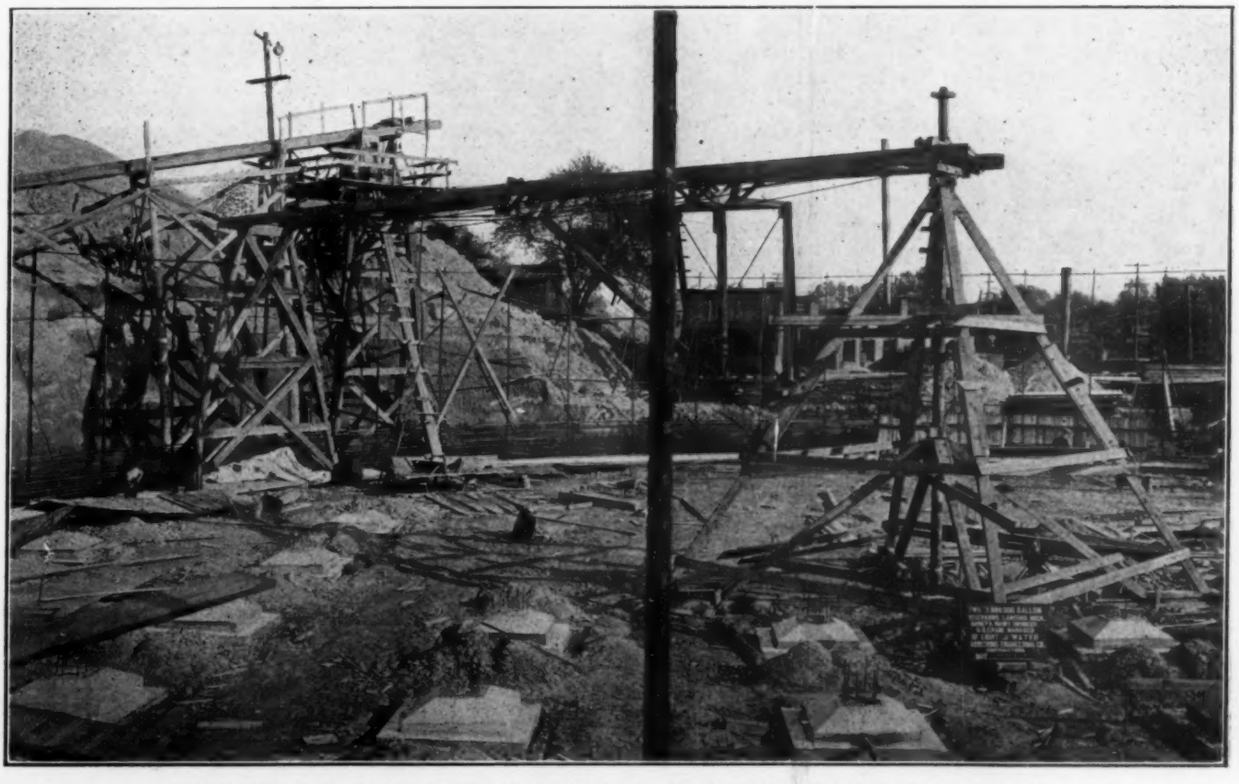
The specifications for this work prohibited the chuting of concrete. To comply with the specifications and at the same time avoid laborious handling of the concrete with wheelbarrows, a turn-table, pivoted at the center of the reservoir, was built. The inside diameter of each reservoir is 155 feet and the height at the wall is 23 feet



REINFORCEMENT AND INDUSTRIAL RAILWAY.

At the upper left hand of the cut on the right is seen the inclined track referred to, by which the contractor carried sand, gravel and cement from the railroad siding to an elevated portion of the area occupied by the work. In the foreground is shown a part of the reinforcement of the reservoir wall in place, and the groove in the concrete bottom by which the wall is bonded to it.

In the cut below is seen, at the right, the pivot about which the turn-table revolves; and at the left the traveling A-frame, the hopper by which the concrete is carried to place, and the mixed discharging into it.



TURN-TABLE FOR DISTRIBUTING CONCRETE TO RESERVOIR WALL AND BOTTOM.

10 inches. A circular track was laid around the circumference of the reservoir about 18 inches inside of the wall footing. This carried a heavy A frame some thirty inches higher than the top of the reservoir wall. A wooden truss extended from the top of the frame to the pivot at the center of the reservoir, this truss being supported by means of a collar at the pivot. The pivot was a heavy piece of pipe well braced in four directions. One of the wheels supporting the A frame end of the turn-table was geared to an electric motor. In pouring the walls, the mixer discharged into a hopper fastened to the A frame, the turn-table was revolved and the concrete discharged into the forms. In pouring columns, floor and roof, the concrete is carried across the truss of the turn-table on a car. One set of forms was used for the wall, which was poured in four-foot sections. A step joint was used as a construction joint between four-foot wall sections.

The total job includes 17,000 cubic yards of excavation, 3,500 cubic yards of concrete, 645,000 pounds of reinforcing steel and 18,000 pounds of structural steel. The contract was let to the Armstrong Engineering Company, whose bid of $73,683 was the lowest of the several bids submitted. Plans and specifications for the work were prepared in the office of Dabney H. Maury, consulting engineer, Chicago, Ill. The resident engineer is Jesse Potter.

MUNICIPAL WATER DEPARTMENT FINANCES

Practice of Several Cities as to Maintaining Finances and Accounts Separate from Those of Other City Departments.

By JAMES FURSE.*

The question of operating the water works plant of the city of Savannah, Georgia, entirely separate from all other departments of the city has recently been forcibly presented, for the reason that the city is now faced with the necessity of rehabilitating the plant. No reserve for depreciation has been created during the thirty years or more that the present plant has been in use, so that the city must now meet necessary and expensive repairs and renewals from its general fund or resort to the issue of bonds.

The Water Works Department, while it should not be operated at a profit, should be able to provide a depreciation fund, should take care of all extensions and betterments, should pay the interest on its bonds and provide a sinking fund for the redemption thereof, and furthermore should yield to the city some return on its investment. The last point is recognized by Richmond, Va., and Holyoke, Mass., both of which cities tax the water works department.

In order to ascertain how the water works department was operated in other cities, I wrote to twenty-six widely scattered cities, and received interesting replies from seventeen.

A brief summary of the replies is given below:

Atlanta, Ga.—Atlanta does not keep its water receipts separate and does not retain any special fund for the purpose of rehabilitating the plant.

Augusta, Ga.—All cash receipts from whatever source are placed in the common treasury. In 1912 the waterworks were mortgaged to secure a bond issue to be devoted to the erection of a levee; consequently the question arises as to whether any segregation of the water receipts would be valid.

Birmingham, Ala.—Except for an auxiliary plant furnishing water to North Birmingham alone, the waterworks plant is owned by a private corporation. The city of Birmingham purchases the water by meter and supplies the consumers.

Camden, N. J.—Water department receipts of this city are turned into the general treasury as general revenue, and annual appropriations are made for maintenance. There are no segregations of funds for specific purposes.

Columbia, S. C.—Columbia has a commission form of government. However, there is no segregation of the cash receipts of the water department.

Holyoke, Mass.—The moneys and accounts of the water department are kept separate and distinct from all other departments of the city. The water department meets its own interest on bonds and sinking fund requirements. The city pays the water department for water used in all branches of its government and in turn taxes the water department on the basis of its construction account.

Houston, Tex.—The water department is not operated as a separate institution. Water revenue is placed in the general fund.

Jacksonville, Fla.—The accounts of the water works have always been kept separate from other municipal accounts; the cash receipts from waterworks are entirely separate from other receipts and the moneys are kept in a separate account. Funds for the purpose of necessary renewals and replacements are set aside from time to time. The water department also contributes its proportion to the general sinking fund of the city.

Los Angeles, Cal.—The water department is under a City Commission known as the Public Service Commission. Receipts are turned in to the city treasury to the water revenue account. No reserve fund is set up to take care of depreciation, but the profits are sufficient to take care of this item as well as of extensions and betterments and of part of the interest and sinking fund of the water bonded debt.

Memphis, Tenn.—The water works plant is operated as a distinct department of the city, administered by three commissioners with separate officers and separate treasury.

Nashville, Tenn.—Receipts from water are handled as ordinary revenue receipts. No special or separate fund is kept in bank therefor.

New Orleans, La.—The sewerage and water board of the city of New Orleans keeps its receipts from water rent entirely separate.

Richmond, Va.—Revenues are not set up solely for use of the water works. However, the special accountant of the city prepares an annual statement of operations in which the water works plant is charged with depreciation, interest on bonds, reserve for redemption of bonds, and taxes.

Spokane, Wash.—Cash receipts for water department are kept entirely separate from all other city funds. Sinking fund is provided for redempton of bonds. Depreciation reserve account is provided to take care of the depreciation charged off each year, but no corresponding asset account (depreciation reserve fund) is set up.

Trenton, N. J.—Receipts from water rents are kept entirely separate and are used only for the purposes of the water department. A sinking fund for the redemption of water bonds is maintained exclusively from water rents.

*Comptroller, City of Savannah, Ga.

HINTS FROM EMPLOYEES.

The Water Department of St. Louis, in order to encourage the employees of the supply and purifying section to present suggestions in regard to improvements in the plant or in ways of doing work, or any other changes that might be desirable, offered vacations of from three days to a week for the six best suggestions sent in during each of two periods ending June 1 and December 1, 1916. A total of 161 suggestions were received, many of which were valuable, and nearly all were such as could be carried out to advantage, occasionally with modifications. The best result of the scheme, however, in the opinion of Commissioner Edward E. Wall, came from the interest aroused among the employees, each in his own particular work, and the evident study in detail which he gave to it in the hope that he might win the additional vacation as well as beat his fellows at the game.

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GET FIRE HYDRANTS INTO SHAPE.

Probably all are familiar with the story of the darkey whose cabin roof a visitor during a rain storm found to be leaking, and who said, on having his attention called to it: "You certainly don't expect me to go out in this rain and fix it, do you?" The next day, when the sun was shining, the same visitor found the tenant loafing in front of his cabin, and remarked that he supposed the roof had been fixed, to which came the reply: "Why for should I bother with that roof? It ain't leaking now."

Fire hydrants have not been freezing in the northern hemisphere during the past few weeks, but ten or fifteen weeks from now they may be; and that time is none too long for making a thorough inspection and overhauling of them in a city where they are numbered by the hundreds. We do not hear so often as we used to the excuse for failure of the Fire Department to control a fire that "the fire hydrants were frozen"; but there is still enough of such trouble occuring to furnish material for discussions every year or two before conventions of water works men and fire chiefs.

There is little excuse for a frozen hydrant if the city authorities only place absolute control of the hydrants with the water department. In the majority of cases a frozen hydrant is due to water standing in the hydrant or the ground immediately around it. This is caused by failure to close the valve tight; failure of the drip to open properly when the hydrant is closed, or of the ground around it to drain away the escaping water; or failure of the drip to close when the hydrant is open thus allowing water to escape through the drip under pressure and flood the surrounding ground. In some cases the hydrant connection is too near the surface and is itself frozen.

If any such conditions exist they should be ascertained now and remedied before cold weather arrives. The valve may be worn or damaged so that it can not be closed tightly, which condition can generally be learned by applying the ear to the hydrant stem, using it as an aquaphone. Prevention of such condition can generally be secured only by absolute prevention of the use of fire hydrants by any but firemen, and by examination by an expert of each hydrant immediately after each use of it.

If the ground is becoming water-soaked, this can be learned by driving into it near the hydrant a small pipe in which is a rod that fits into it loosely (the rod is to prevent dirt entering the pipe), then withdrawing the rod and noting whether water rises in the pipe. The remedy is to repair the drip, or lay a drain pipe from the drip to a sewer or some other outlet—preferably both. A freezing hydrant connection probably requires a lowering of the connection, and this may involve replacing the hydrant with one with a longer barrel. Water in a connection has no motion and is more likely to freeze than that in a main; and location below frost depth is therefore more necessary for a connection than for a main.

It is none too early to begin the detection and remedying of these conditions in climates where there is any danger of hydrants freezing.

WATERWORKS PATRIOTISM.

Much has been written concerning the value and necessity to the government of good roads as an aid in prosecuting the war, and the maintenance and extension of them is a duty of the cities and states even greater now than in the past. This, however, is not the only branch of public works which public duty and patriotism demand that we keep up to a maximum state of efficiency. The minimizing of fire losses by increased effectiveness of fire-fighting facilities is of the greatest importance, and this means the extension of water supply systems so that abundant water may be available for fire fighting and that every danger point be served by mains of ample capacity. Said President Wilson a few weeks ago: "At a time like this of emergency and of manifest necessity for the conservation of national resources, it is more than ever a matter of deep and pressing consequence that every means should be taken to prevent this evil" (destruction of property by fire).

The economic justification for fire protection is that it costs less than the value of the structures and their contents whose destruction it may prevent. It is true that waterworks extensions cost more now than they did, but on the other hand the rebuilding of burned structures and replacing destroyed property would cost more, and this increased replacement value of property justifies increased expenditure for its protection.

Nor is this the only or perhaps the most vital consideration. Replacing the destroyed property would withdraw labor from work essential to war preparations, and such property might itself have been employed in such preparations and its removal from service be a matter of serious consequence.

It is of the utmost importance that the water departments and companies in all of our cities keep their supplies and distribution systems at the topmost notch of efficiency, and they should not permit themselves to be deterred from this by high prices or any other considerations.

CHARGING RAILROADS FOR WATER.

The rates charged by a number of cities of Minnesota for furnishing water to railroads was made the subject of a questionnaire by the League of Minnesota Municipalities some weeks ago, and the ordinary monthly pumpage of the plant, the ordinary monthly consumption of the railroads, the approximate monthly gross receipts from water sold by the plant, and the rates charged to railroads, were ascertained for 27 municipalities.

The majority of them did not know both the monthly pumpage and monthly consumption by the railroads, although many of them gave an estimate of these. The figures furnished show that about one-half the amount pumped was used by the railroads in Brainerd and Morris; about one-quarter in Duluth and Two Harbors; while a number of other cities reported approximately 10 per cent. used by the railroads.

The rates to the railroad varied greatly. A flat rate per month was charged by several cities. Brainerd charged $485, Detroit $100, Elmore $4.16, Hinckley $85, Rush City $75, Perham $40, St. Cloud $50, Wadena $40. A larger number of cities metered the water and charged the following rates per thousand gallons: Crookston, 40c to 8c; East Grand Forks, 50c to 35c; Fergus Falls, 10c; Little Falls, 4c; Luverne, 10c; McKinley, 10c to 7c; Mankato, 90c to 45c; Morris, 7c; Minneapolis, 8c; Owatonna, 30c to 8c; Sauk Center, 8c; Two Harbors, 30c to 3¾c; Worthington, 4½c to 3c. The following cities metered and charged by the 100 cu. ft. as follows: Duluth, 15c to 8c; Ely, 27c to 5c; Moorhead, 30c to 5c; St. Paul, 6c.

RECONSTRUCTING COMPTON HILL RESERVOIR

Waterproofing With Asphalt Membrane—Interlocking Steel Sheet Piling Cut-off Wall—Extending Height of Slope by Concrete Retaining Wall.

The water supply of the city of St. Louis is pumped from the Mississippi river and passed through a purification plant, after which practically one half of the supply is pumped into mains connected to the Compton Hill reservoir, about 185 feet above city datum, the other half being delivered under direct pressure approximately 35 pounds greater than that supplied by this reservoir.

The reservoir was built 870 feet long, 540 feet wide and 22 feet deep and was completed in 1870. It was divided into two compartments by a middle dividing wall. It was mostly in excavation. A layer of puddle 2 feet thick was spread over the entire bottom and extended up the stepped slopes in the excavation to the puddle wall of the embankment, with which it was connected. A 6-inch lining of concrete was placed over the bottom, on top of the puddle.

More or less leakage developed in the reservoir, and in 1912 leakage tests showed heavy losses in the north basin through a large hole in the bottom where the floor had broken and sunk several feet. This hole was cleaned out and filled with concrete, the floor replaced and the entire slope and bottom carefully examined for other leaks, a few minor ones being found and repaired. In 1914 and in 1915 settlements appeared near the same point in the south basin and were repaired, together with smaller ones at other points. It was evident that something more permanent and more thorough than patching was necessary to make the reservoir safe, and it was decided to reconstruct it.

Many suggested schemes were designed and estimated in whole or in part, the one finally adopted possessing the advantage of considerably less cost than the others with equally safe construction. The plan included the driving of a cut-off wall of interlocking sheet piling through the core of the old embankment to bed rock; the waterproofing of the sides and the bottom of the basins with a membrane waterproofing laid on concrete and protected by concrete; a replacing of the old division wall with a new one of concrete, much heavier and 10 feet higher, supported on concrete piles and on a reinforced concrete cut-off wall carried to bed rock; and the construction of a reinforced concrete retaining wall on top of the slope, carried on the steel sheet piling and on concrete piles driven into the original ground. In addition, a new gate house of reinforced concrete and an ornamental fountain and stairway on the west front were provided.

Before reconstruction the capacity of the reservoir filled to elevation 174 was 56 million gallons; while the new construction permits raising the water to elevation 186 and increases the capacity to 85 million gallons. Bids for the work were received in August, 1916, and the entire reconstruction is now practically completed. Nineteen bids were received, their totals varying from $280,187 to $406,800, and averaging $336,509. The contract was awarded to the lowest bidder, the Hiram Lloyd Building & Construction Company.

Storage is necessary for the operation of the water supply system, since the pumping plant and mains are not adapted to maintaining a direct-pressure service during the maximum summer and winter consumptions. Consequently the specifications provided that work which required draining both basins should be completed between September 15 and December 15, 1915; this including tearing down the old gate house, dividing wall and gate chambers, and constructing a new chamber and division wall; also such strips of the floor and slopes of the north basin were to be waterproofed as were necessary to permitting of its being put into service while the south basin was emptied for reconstruction; then, when the south basin had been completed, it was to be filled and the north basin drained and reconstructed. The whole contract was to be completed and ready for service by December, 1916, but owing to certain delays (for some of which the city was responsible), the work is just about completed.

DIVISION WALL.

The main division wall is of reinforced concrete of a semi-gravity section, 37 feet high, 30 feet wide at the base and 3 feet at the top under the coping, which is 1 foot thick and 4 feet wide. The wall batters on both sides, the batter changing at three points, the successive batters being 9⅜ inches to the foot, 4 inches, 2 inches, and 1½ inch respectively. Beneath the division wall, on its center line, a concrete cut-off wall (which is practically a continuation of the division wall) 3 feet thick extends through yellow clay to bed rock, an average distance of 15 ft. In addition to serving as a cut-off, this wall offers considerable support to the division wall. That wall is supported also by four rows of reinforced concrete piles driving to bed rock, two rows on each side; the rows being 4 feet apart between centers and the piles in each row 3 feet between centers. The wall is divided into three sections, each 129 feet long, by two expansion joints; and in addition, expansion joints are provided at the ends where the wall connects with the two gate chambers. The expansion joints are of the tongue-and-groove type. One side of the joint having been poured, this was covered with asphalt and asphalt-impregnated felt built up to a depth of ¾ of an inch: following which the other half of the joint was poured

against this. During the past summer, when the north basin was full and the south basin empty, this joint filling was partly squeezed out by the expanding concrete so as to project, at one point, more than 2 feet beyond the face of the wall. There was very little leakage through these joints.

The wall was calculated to resist the water pressure against one side, considerable impact from waves, and hydrostatic pressure under the part of the footing outside of the cut-off wall. Resistance to these several forces required the use of reinforcements, and for this there were used round deformed bars ⅝ inch in diameter spaced 15 inches on centers and extending the full height of the wall, following the contour of the face and 3 inches from it. In addition, ⅝-inch horizontal bars were spaced 24 inches on centers. At the expansion joints, additional vertical and horizontal bars were placed in the upper 12 feet of the wall, the horizontal bars being bent to fit closely the tongue and groove of the joint.

The gate chambers at the two ends of the wall are of reinforced concrete, carried on concrete piles driven to rock and on a concrete cut-off wall 3 feet thick and continuous with that under the division wall.

All the concrete in the division wall and gate chambers is mixed one sack of cement to each six cubic feet of aggregate, the proportions of sand and coarse aggregate being such as to produce a maximum density, the mixture being practically 1:2½:5. Large stones from the old division wall and chambers could be used as plums in the concrete of the curtain walls, division wall and the fill around the chambers, provided they were well bedded and kept 6 inches away from the face of the forms and from each other. Stones not so used (6,750 cu. yds. were taken out of the old walls) were crushed and used as coarse aggregate.

WATERPROOFING BOTTOM.

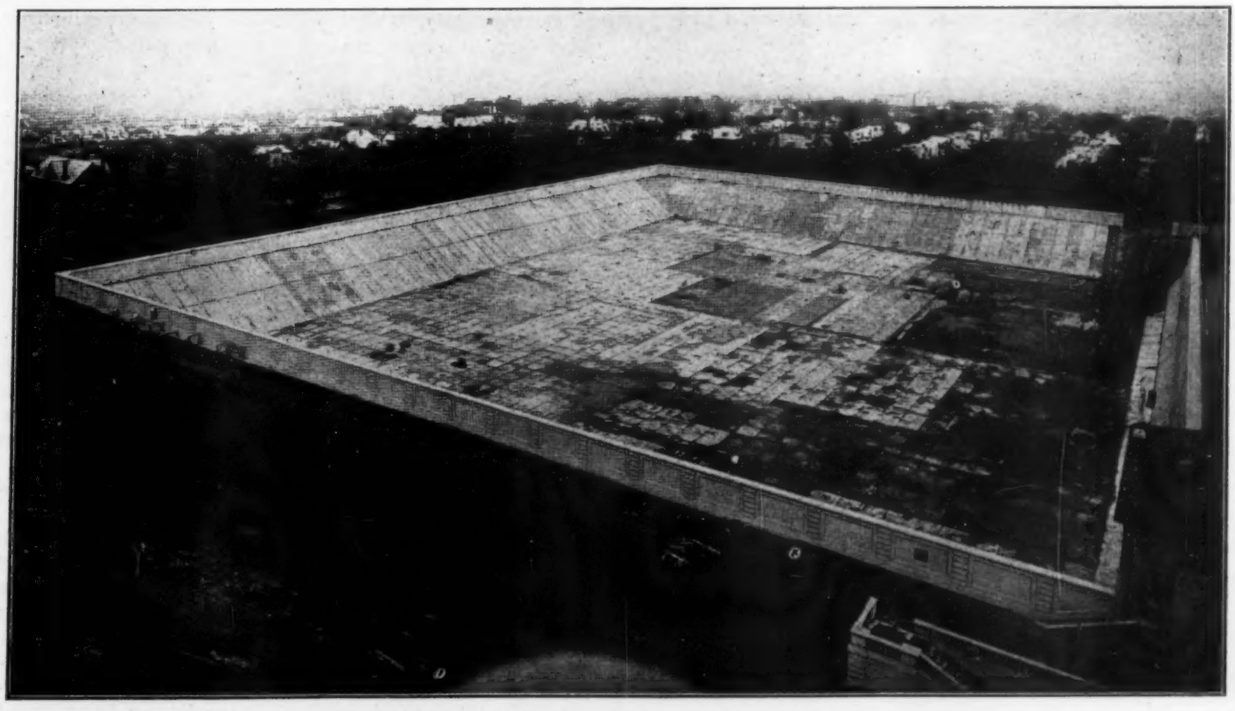
The method adopted for waterproofing the bottom was much the same as that which had been used on the bottom of the basins at the Chain of Rocks, where the underlying stratum was quicksand. As already described, the original bottom of the Compton Hill basins was puddle covered with 6 inches of concrete. The surface of this concrete was very rough and the stones projected above the mortar, the latter being so soft in spots that it could be picked out with the fingers. In order to secure a surface on which waterproofing paper could be laid, this concrete was leveled up with 3 inches of 1:6 concrete, laid in blocks about 8 feet square with half-inch expansion joints between them filled with an asphaltic joint filler. On this new concrete was laid a waterproofing consisting of six layers of pitch and five layers of 14-pound pitch-impregnated long-fiber wool felt, the layers alternating and the whole being thoroughly cemented together. The war has made the securing of good felt very difficult.

To protect this waterproofing from injury, it was covered with 3 inches of concrete laid in blocks which broke joints about 2 feet with the blocks below, the half-inch joints in these blocks being filled with asphalt filler. This concrete lining was troweled to a smooth surface.

WATERPROOFING SLOPES.

The inner face of the embankment had a slope of 1½ to 1 and a vertical height of 26 feet, all but the upper 2 feet of which was lined with limestone blocks 16 inches thick laid on an 8-inch bed of macadam. Before applying waterproofing, the exposed faces of these stones were cleaned of all loose material and covered with a 3-inch layer of 1:6 concrete laid in strips 8 feet wide, with ½-inch expansion joints between strips and a horizontal one at the middle of the slope. The concrete was thoroughly bonded to the paving blocks by removing one block in every 64 square feet and filling this space with concrete as the pouring proceeded.

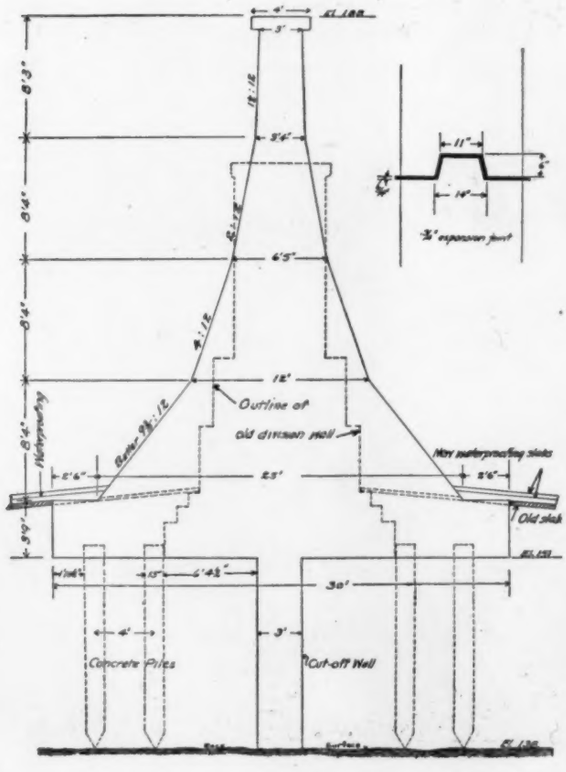
When the concrete had set, it was mopped with an asphaltic base primer coat made by dissolving asphalt in benzine, and was then covered with six layers of hot



NORTH BASIN OF COMPTON HILL RESERVOIR.
Division wall at the extreme right. Ramp for teams at further end of wall. Sides and most of bottom covered with concrete ready to receive waterproofing.

asphalt and five layers of 14-pound asphalt-impregnated felt. Asphalt was used instead of pitch in order to avoid the slipping of the waterproofing on hot days, which would be apt to occur with pitch, and in order to secure a material which would remain pliable under water Bermudez Lake asphalt, with a melting point of about 180 degrees, or one equivalent in all respects, was required.

Over the waterproofing was placed a protective slab of concrete 3 inches thick, which breaks joints with the slab below. Reinforcement of No. 23 triangle wire mesh is imbedded in the upper 10 feet of the bottom layer and in the entire area of the covering layer of concrete. At the top of the bank this mesh is securely fastened to ½-inch bars spaced 12 inches between centers and imbedded in the concrete of the retaining wall, thus providing anchorage for the upper half of the strip. The reinforcement in the lower half is secured to a ⅝-inch horizontal bar 6 feet long, which in turn is wired to four steel dowels set in the concrete of the bottom layer. Where the slope joins the bottom, the slope slab extends out over the bottom about 6 feet, being thickened to 15 inches at the angle, thus providing additional anchorage, as in the bottom all expansion joints are filled with asphaltic filler. For the first 200 feet of top laid, the anchors for the lower half of the strip were not used and the corner angle at the bottom was much thinner. The lower concrete, placed dry, at first was broomed over with grout, leaving a fairly rough surface on which to mop asphalt and lay paper. Later, to make the mopping easier, the surface was smoothed by coating with mortar and troweling. On a very hot day, under the direct rays of the sun, the temperature of the asphalt and paper reached more than 140 degrees, even though laid the afternoon before, and when the top was placed over this, concrete and paper both began to slide down the slope. Further trouble of this kind was prevented by changing back to the rougher broomed surface, by thickening the base, and by using iron pin anchors on the lower slab: though a small section of paper on a 30-foot section of the east slope, placed in the morning, started to slide in the afternoon of a very hot July day before the top layer of concrete was placed.



TYPICAL SECTION OF DIVISION WALL.

A concrete wall of semi-gravity section 37 ft. high, supported on a concrete cut-off wall and concrete piling.

STEEL SHEET PILING.

To provide against the possibility of a break or other cause of leakage through the waterproofing, a sheet piling curtain wall of interlocking steel piling was driven around the reservoir, extending from the top of the old bank to bed rock. Such a construction at the Chain of Rocks basins had effectually stopped quicksand movements and had been in place for six years without damaging corrosion. The steel piling at Compton Hill is driven through yellow clay which it is believed will prevent corrosion. Lackawanna arched web section weighing 40.83 pounds per lineal foot and 14 inches wide (making 13½ inches of finished wall) was driven in lengths varying from 34 to 50 feet. The city made borings at intervals of 25 feet along a line 10 feet outside of the piling in order to determine the depth of piling required. The contractor was paid for the full length of every pile driven, including any that might be above grade and had to be cut off, and also for capping with concrete all piling that was below grade. The rock bottom reached by the piling varied considerably from the boring depths.

This piling projects 12 inches into the footing of the retaining wall, and the footing reinforcement is run through holes burned in the piling by means of an oxy-acetylene burner. At the gate chambers this piling interlocked with piles which were embedded in the concrete wall of the chamber and of the footing beneath, thus forming a continuous cut-off wall around each basin.

RETAINING WALL.

As already described, the entire reservoir was surrounded by a reinforced concrete retaining wall so as to increase its capacity. This wall is supported on the steel sheet piling and on two rows of reinforced concrete piles 20 feet long, one on either side of the sheet piling and 10 feet apart on centers. They were driven about 5 feet into the original yellow clay, which has been undisturbed during any work on the reservoir. The footing of this wall is about 9 feet wide and 3 feet thick, the inner face being poured against the stone paving blocks on the slope. The waterproofing and the upper concrete slabs overlap it about 6 feet to provide a watertight bond. The wall proper is vertical, 10 feet high and 18 inches thick, of cantilever design.

The concrete in the base below the ground is composed of one sack of cement to 6 cu. feet of concrete; while above the ground line one sack of cement was used to 4½ cu. feet of concrete, the aggregates being Meramec river sand and hard crushed limestone one inch and smaller. Ten pounds of hydrated lime was used to each sack of cement, and the mixing was continued not less than 3 minutes after all the materials were in the mixer.

The lime acts as a waterproofing, serves to make the concrete pour more easily, prevents separation, and gives a much lighter appearance to the wall. When the concrete is mixed fairly dry it is very gummy and hangs together and to the steel, causing separation lines where it is not well spaded along the face; but this is prevented by making the mixture a little wetter. The 3-minute mixing has been used in the Water Department specifications since 1913 wherever waterproof concrete is wanted, as has also the ten pounds of hydrated lime

to each sack of cement. Results have been very satisfactory and the difference in the appearance of the resulting concrete from that mixed from ½ minute to 1 minute is very marked. It can be carted over 500 feet and the carts dumped clean without scraping and without any separation of the aggregates. From the inspection standpoint an added advantage is in the additional time given for proper placing of a batch.

Reinforcement to permit the wall to act as a cantilever is provided by ⅝-inch vertical bars spaced 10 inches on centers. There are no expansion joints in the wall, and horizontal reinforcement is provided to distribute temperature cracks. The horizontal reinforcement is spaced 3 inches from the inner face and 2½ from the outer, and amounts to a little more than one-half of 1 per cent of the sectional area of the wall. The wall forms the sides of a rectangle 834½ feet long and 505¼ feet wide. The walls poured in the hottest parts of the summer show small hair cracks which generally appeared at the end of the depressed panel shortly after pouring; but these have not opened visibly with changes in temperature, although the thermometer has been as low as 12 degrees below zero. Provision was made for painting the inside of the wall with a bituminous coating to minimize discolorations on the outer face and to reduce possible algae growths.

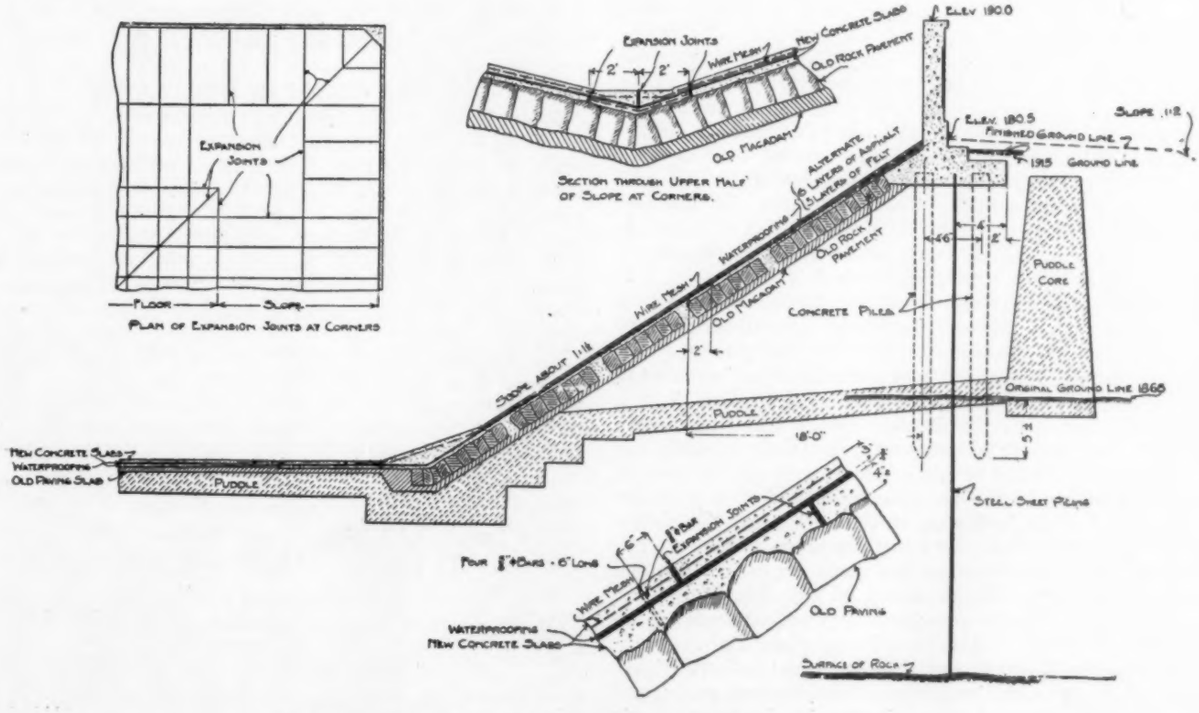
The concrete piles under the division wall were required to be pre-cast and those used in the rest of the work could be either pre-cast or made in place, but the contractor elected to use pre-cast piles throughout, making them in a section 12 inches square with one-inch chamfers at corners, and straight throughout the length except at the point, where they taper to 8 by 8 inches in a length of 12 inches. At first, curing for 30 days was required, but later, piling which had been cast only 10 days was driven by 400 blows of the Vulcan hammer through 15 feet of moist yellow clay to bed rock, with no injury, not even the spalling of the head.

CONSTRUCTION METHODS.

The old limestone masonry division wall and gate chambers were drilled 6 feet deep with churn drills and loosened or thrown down by blasting with 3-stick charges at the end of each shift (work was carried on both day and night). Two stiff-leg derricks mounted on triangular towers 18½ feet high with 33½ by 33½-foot base and having 40-foot masts and 80-foot booms, were used to remove the old stone and later to place plums in the new wall.

The concreting plant was mounted on a 12-foot gauge track, one rail being the same as that used for the derricks. It was placed about 20 feet south of the center line of the wall and comprised a ¼-yard Marsh-Capron mixer operated by a 50-h.p., 220-volt, a. c., 3-phase motor; also a timber tower, bolted throughout, 70 feet high, in which traveled a bucket at a speed of 75 feet per minute and delivered the concrete to self-supporting gravity chutes. For both wall and chambers, sectional wood forms about 8 feet 6 inches by 6 feet 3 inches for the wall, and 8 feet 6 inches by 15 feet for the chambers, were used, the wall forms being handled by a traveling gantry crane of 40 feet span. The wood forms were tied together by ½-inch rods, two to each section of form, placed horizontally near the end of each section and in three rows to each lift. These rods, some of them more than 25 feet long, were slipped into closely-fitting spirally wrapped paper casings, from which they were withdrawn easily after the concrete had set. When the rods had been withdrawn, the paper was unwound for about 18 inches at each end of the hole and it was then filled with mortar.

For driving the sheet piling the contractor used a No. 1 Vulcan hammer in 70-foot leads, which were guyed laterally to dead men. In driving the steel piling it was found that there was a tendency for it to kick back at the bottom, so that the piles gradually worked away from the perpendicular. To remedy this, twenty-two



WATERPROOFING ON BOTTOM AND SLOPES OF RESERVOIR.

A layer of concrete, leveling the old surface, is covered with a five-ply waterproofing membrane, and that is protected by a three-inch layer of concrete.

wedges were used, made by splitting a pile longitudinally through the middle of a web and riveting each half to a tapered piece of steel plate ⅜ inch thick, thus making a pile 13½ inches wide at the top and 25½ inches at the bottom. The number of blows necessary to drive a 50-foot pile generally varied from 378 to 604, 146 blows being the least used on any pile.

For placing concrete on the slopes, another traveling plant was used consisting of a steam-driven mixer and engine mounted on a platform on wide-gauge trucks traveling on the same tracks as the other plant. The bucket carrying the concrete traveled on an I-beam boom which was kept at the same inclination as the slope that was being concreted and about 8 feet above it. Progress in this work was slow, and it was decided to pour the lower half of the bottom slab from the tower plant, and the upper half of the bottom slab and all of the top slab by the slope machine. Another steam-driven mixer was used solely for both top and bottom slabs of the bottom of the basin.

The work was in the direct charge of Hiram Lloyd for the contractor, Charles E. Gove being superintendent during 1916. For the city, the work was under the direction of water commissioner Edward E. Wall. The preliminary estimates, the plans and the specifications were prepared by S. W. Bowen. The total cost of the work was approximately $305,000.

GOOD SEWER WORK FOR CAMP TAYLOR

Seepage Into Vitrified Pipe and Segmental Block Sewer Very Low in Spite of Hurried Work in Saturated Ground—Figures of Seepage Measurement.

By D. R. LYMAN.*

There was recently completed, extending from the Beargrass interceptor of the sewerage system of Louisville, Ky., a sewer 12,185 feet long to serve Camp Taylor, the United States Army cantonment, in which 42,000 drafted men are to be trained for service. The sewer follows the meanderings of Beargrass creek in the flat bottom land, crossing under the creek 6 times, the grade of the invert being at all points lower than the bed of the creek. The sewer is 30 inches and 24 inches in diameter, the 30-inch section being constructed of American Sewer Pipe Company's vitrified segmental blocks, and the 24-inch section being of vitrified pipe. The former is 7,289 feet long, the latter 4,887 feet. The average cut is about 13 feet and the soil is yellow and blue clay, bearing water at a depth of about 8 feet.

Owing to the proximity of Beargrass creek and a row of hills on each side of the creek, a large amount of ground water was encountered continuously throughout the work, and pumping was constantly necessary in the 30-inch section. Portland cement mortar, mixed 1 to 1, was used for both the 30-inch blocks and the 24-inch pipes. No unusual precautions were taken to make the joints watertight. The work was very much hurried all the time owing to the necessity of completing it before the arrival of drafted men at Camp Taylor. To facilitate the construction, two contracts were let on July 7th on the cost-plus-percentage basis, one for the 30-inch and the other for the 24-inch sewer, with a time limit of 60 days. The work was completed and entirely celaned up on August 22nd, 16 days within the time limit.

It was anticipated that the combined effects of extremely rapid work, large amount of ground water, and the large number of joints in the block sewer, would result in abnormal infiltration. To determine whether this was the case, careful measurements of the seepage were made immediately after the completion of the sewer, and, contrary to expectations, the amount of infiltration was less than the amount indicated by several authorities on sewer construction as reasonably to be expected. In Folwell's "Sewerage," for instance, it is stated that with care the infiltration can be kept as low as 1 cubic foot per second in 30 to 100 miles, but in the case of this sewer, laid under adverse conditions, the infiltration was found to be 0.57 cubic foot per second per 100 miles on the 24-inch pipe, and 1.36 on the 30-inch block sewer. It was expected that, owing to the large number of joints in the 30-inch block sewer, the amount of infiltration would be greater than in the 24-inch pipe; but it was shown by these tests that the infiltration per foot of joint was greater in the pipe than in the segmental tile, the former being 0.225 gallon per day per foot of joint, and the latter 0.12 per foot of joint. The results of the test are shown in the accompanying table.

The plans for this sewer were drawn by the Department of Engineering of the city of Louisville, and the construction was carried out by J. B. F. Breed, consulting engineer, and John Chambers, supervising engineer, acting under special appointment from the Fiscal Court of Jefferson county.

*Chief Engineer, Dept. of Engineering, Louisville, Ky.

INFILTRATION TESTS ON
Jefferson County Cantonment Sewer, Louisville, Ky.
Made August 22, 1917.
24-in. Vitrified Pipe Sewer and 30-in. Amco Vitrified Segmental Block Sewer.

Length of 24-in. tested, 4,667 ft. = .88 mile; Grade 0.24%
Length of 30-in. tested, 6,600 ft. = 1.25 mile; Grade 0.12%

	Cu. ft. per second
Capacity of 24-in.	11
Capacity of 30-in.	14
Infiltration, 24-in. sewer	.005
Infiltration, 30-in. sewer	.017
Infiltration, 24-in. sewer, per mile	.0057
Infiltration, 30-in. sewer, per mile	.0136
	Gallons per day
Infiltration, 24-in. sewer, per mile	3744
Infiltration, 30-in. sewer, per mile	8853
Infiltration, 24-in., per foot of joint	0.225
Infiltration, 30-in., per foot of joint	0.12

MOTOR TRUCKS IN PORTLAND.

Some details concerning the operation of three motor trucks in Portland, Oregon, have been sent us by the city engineer, O. Laurgaard. The Bureau of Highways and Bridges of the Water Works Department operates one gasoline truck of 2 tons capacity, and the Bureau of Sewers operates two 1½-ton gasoline trucks.

The figures from Dec. 1, 1915, to Nov. 30, 1916, of a 1½-ton Federal truck used by the Sewer Department, are given by Mr. Laurgaard as follows:

Gasoline	Gals.	2,071½
Lubricating oil	Qts.	379½
Transmission oil	Qts.	31
Cup grease	Lbs.	2
Equipment		$28.53
Repairs		37.29
Miscellaneous cost		6.76

The total mileage for the year was 13,021 miles. This gives about 6.3 miles per gallon of gasoline.

The Bureau of Highways and Bridges, using a 2-ton Packard, with a mileage of 6,089 miles, used the following materials:

Gasoline	Gals.	1,414½
Lubricating oil	Qts.	711
Transmission oil	Qts.	33
Cup grease	Lbs.	9
Kerosene	Pts.	29
Tire cost		$113.54
Equipment cost		23.08
Repairs		175.78
Miscellaneous cost		17.40

The city of Portland maintains a municipal garage and repair shop, and keeps an accurate account of the mileage of each truck, the amount of gasoline and oil that it uses and the cost of tires, repairs and other items of maintenance and operation.

MACHINERY IN TRENCHING

Three Methods of Varying Efficiency Employed by Different Contractors—Trench Excavators and Grab Buckets Used in Different Ways.

Sometimes descriptions of incorrect methods of doing work are quite as valuable as those of doing work well. How not to do it is quite as valuable knowledge as how to do it, at least to the extent of showing what modifications of plans not directly applicable to a particular case can not be made with satisfaction. The jobs here described will therefore be anonymous as to contractor and location and each reader can draw his own lessons and apply them to his own problem.

The period of operation covered by the observations was one of the best of weather, rather hot and dry, with little water in the trenches. The soil was stiff clay, standing with only occasional vertical sheeting and a single horizontal ranger if any. The lower half of one trench was through a rather soft shale which could be picked or dug with a steam-shovel, but was sometimes blasted. The streets were paved with brick or asphalt and but one of them had street car tracks and in that one the sewer line was along the curb so that neither tracks nor water mains were interfered with. In short, the conditions were nearly all of them very favorable to rapid and economical construction.

The first contract described is of concrete pipe 48 to 36 inches in diameter, of which a length 142 feet of 48-inch with average cut of 11 ft., and 440 feet of 42-inch with average cut of 10.6 ft. was laid out and partly back-filled in 12 days. No compacting of back-fill was done except dumping from dump-car. The 142 ft. of 48-inch pipe was laid in 2 days.

A Keystone trench excavator was used, being a bucket on the end of a lever arm hinged to the end of the boom of the machine so that the bucket can be thrown out almost to the limit of the sum of the lengths of boom and arm and then drawn toward the machine, digging and then lifting the excavated material and dumping it into car or wagon alongside. The machine stands on the pavement at the end of the ditch and moves along ahead of the trench by its own power. The bucket will dig a trench about 30 inches wide directly and took out the full 11 feet depth of this trench without difficulty. The trench being more than 30 inches wide, in hard clay with a foot or so of disintegrated shale in its bottom, the machine could not take out the full width, although it could doubtless have done so with softer material, and did take out about 42 inches width. The remainder was knocked down to the bottom of the ditch with pick from below or bar from above, making the sides smooth enough for lowering the pipes. The pipes, which are 4 feet long and weigh about one ton each for the 42-inch size, were lowered to place in the trench by a regular 4-legged pipe derrick and differential pulley and a stirrup hooked over the bell end of the pipe. If the pipe was not rolled to the ditch so that it would lower right side up, it was readily turned after lowering by moving the stirrup down one side and then lifting so that the pipe was rolled and shifted. It could thus be centered, the spigot end pushed into the bell end of the pipe already laid, and the necessary adjustment to exact grade made easily. Pipes were handled and set ready for cementing joints in 5 to 10 minutes each, according to the amount of adjustment needed.

The material dredged from the trench was dropped into a dump-car running on about 100 ft. of track laid alongside the trench, hauled back by hand and dumped on the pipe line already completed, three to five buckets filling the car in 1¾ to 3½ minutes. A wagon required five full buckets and a string of wagons four minutes apart could be kept going with the machine in full and steady operation.

One count of the number of men required showed foreman, engineer, and fireman, trip-boy to unload buckets, 2 men on dump-car, 1 man with bar on side of trench, 2 men handling pipe and 2 men laying pipe, each helping on another's job on occasion. The machine saved a considerable number of men, for in the hard clay and shale almost as many picks as shovels would be required and more length of trench would be open at a time.

This job was reasonably well managed and the contractor was making some money on his price of $7.50 per foot for 48-inch pipe complete, $5.70 for 42-inch and $4.70 for 36-inch. The contract included 5 manholes at $45 and 60 feet of 12-in. catch basin drain at $1.70 per ft. of vitrified pipe. The Keystone machine is well adapted for this kind of work.

The second contract described is for a segment-block sewer, of which there is 1,200 ft. of 60-inch diameter, 18.2 ft. average cut, at $11.05 a foot; 560 ft. of 54-inch, 15.6 ft. average cut, at $8.68; 470 ft. of 48-inch, 14.8 ft. average cut; 576 ft. of 36-inch, 12.6 ft. average cut. In the 54-inch portion observed, the cut was from 15.4 ft. to 15.7 ft., over half of which depth was of hard clay and nearly half was of shale which could be picked but was probably moved more economically by some blasting.

In this case the material was excavated by a grab-bucket which in three or four trials could loosen enough to fill the bucket, which was then emptied into a wagon or a dump-car running on a short track. Wagons carried off the surplus, the dump-car back-filling the trench behind the block-layers. The excavating machine ran on rails laid on each side of the trench directly on the pavement, and could be moved back and forth to handle clay and shale as required. It could swing through about 180 degrees horizontally and 60 degrees vertically.

Apparently the presence of the shale was not considered by the contractor in making his bid. Also his work was not well organized and was going very slowly. Consequently he was losing money.

The machine was doing most of the work, the number of men being a minimum; engineer, fireman, foreman who handled the excavator bucket and the pushing and dumping of the dump-car, 3 pick-men in the bottom, timekeeper, and superintendent. Block layers worked intermittently when bottom was ready for laying sewer.

The program of digging observed was first to take out the clay with the grab-bucket. The shale was then loosened up in a thick layer, partly by men with picks and partly by the machine, a nearly vertical face of the end of the layer allowing the bucket to get under the shale layers, lift and break them off. A second layer was treated in the same way, reaching the bottom of the trench. This shale excavation was narrower than the trench and the sides were picked down to proper width for laying the sewer. The segment-blocks allowed rough and projecting trench sides except for the invert, which was carefully excavated to form and shape. This program was slow, especially with the small number of men employed, and blasting would loosen the material so that it could all be handled by the grab-bucket, except some shaping of sides.

Estimates of cost can be of little value on this job,

which, so far as details were concerned, was a good example of how not to do it, although the general plan, if properly carried out, should produce good results. The original bid was probably too low to make it possible for any one to come out even, but losses could be materially diminished by better management.

The third contract described is for a concrete pipe sewer the major part consisting of 4,660 ft. of 72-inch with average cut of 14.3 ft., and 500 ft. of 60-inch with average cut of 16.2 ft. At the point observed, the cut varied from 12.6 to 13.9 ft. and was in stiff clay, the upper portion being rather dry yellow clay and the lower third of blue clay, which was somewhat wet and occasionally required some draining and pumping.

The excavation of this trench was made by two machines. At the end of the trench was located a Keystone machine, which took out about 8 feet depth of yellow clay. The trench was too wide for this machine to handle completely and only about half its width could be taken out directly. The sides of the trench were picked down by men below, occasionally aided by a man with a bar above, and this loose material was lifted by the bucket with that dug out from the middle of the trench. The hard material required some use of the bucket as an excavator until enough loose material was secured to fill the bucket, when it was lifted and dumped into wagons which carried it off as surplus material.

The other machine was a Thew machine operating a grab-bucket which took out the remainder of the material in the trench and handled the pipe. The machine revolves through a full circle, and a bucket of material brought up in front of it was immediately deposited on the completed sewer behind it, without moving the machine. There was a short track and a dump-car to carry material to complete the back-fill farther back. The trench being practically the width of the outside diameter of the concrete pipe, the sides of the trench were dressed carefully for both machines to let the pipes in. By opening the grab-bucket across the trench, its bottom could be taken out to grade and form with a minimum of dressing of the inverts, a little gravel on bottom and behind the sides being all that was necessary to bring the pipes to exact grade and full bearing.

In eleven working days 240 feet of this 72-inch sewer was laid, an average of nearly 22 feet a day.

The Keystone machine moves itself, running on the pavement in advance of the trench. The asphalt pavement was cut along the edge of the trench and the machine dug up aspalt and concrete foundation which was wasted with the rest of the product of this machine.

The Thew machine runs on 8 by 12-in. stringers, one on each side of the trench, and moves itself forward or back.

The method of handling pipe is of interest. There is no projecting bell on the pipe (the "Jackson" pipe is used), the bells and spigots being formed within the 7 inches thickness of the pipe walls. The pipes, which are made at convenient places along the line of the work, are rolled to the place they are to be laid. A pipe is lifted and lowered into the trench by a saddle made of a channel of a little more than 4 ft. length in which is fitted a block of wood rounded to fit the inner ring of the pipe. Stirrups are inserted in the projecting ends of the channel, into which the hooks of the hoist are inserted. The pipes have wider joint spaces at bottom than at top and if they have not rolled in right side up the saddle is slipped down the side and a slight hoisting turns the pipe until, when it is right side up, the pipe is lifted up and lowered into the trench. Here there is substituted for the saddle a stirrup made of two I-beams fastened together at one end so as to be parallel and far enough apart to hook over the outer end of the pipe and long enough to extend nearly to the inner end. Three stirrups in the upper I-beam give opportunity for lifting in any way convenient to lift the pipe and move the spigot end into the bell end of the pipe previously laid and then adjust the pipe while gravel is tamped under it to give exact grade. The weight of the pipe makes it easy to bring it into full bearing. Pipes are handled from street to position ready for cementing joint in 5 to 10 or 12 minutes each, according to amount of adjustment of position and grade necessary. Grade is tested with a standard sewer pipe-laying gauge measuring down from the stretched line above to the lowest point of the invert, and alignment by a plumb-bob dropped from the same stretched line above. A 6-ft. pipe weighs about 4 tons and has walls 7 in. thick. The price for excavating trench, furnishing and laying this 72-in. pipe and refilling trench complete, ready for the pavement, is $9 a linear foot.

The contract was quite well handled and the contractor seemed to be making a reasonable profit. For 60-in. pipe the price is $7. Brick repaving is paid for at $1 a linear foot of trench, a little more than half being for the 72-in. pipe and the remainder for 24 to 15-in. pipe. Asphalt paving is paid for at $1.25 a linear foot, all being over 72-in. pipe trench.

WIDENING A STREET FOR INCREASED TRAFFIC

Details of Work Done in Indianapolis—Widening Wood Block and Asphalt Roadways Without Relaying Old Pavements—Curbs and Gutters

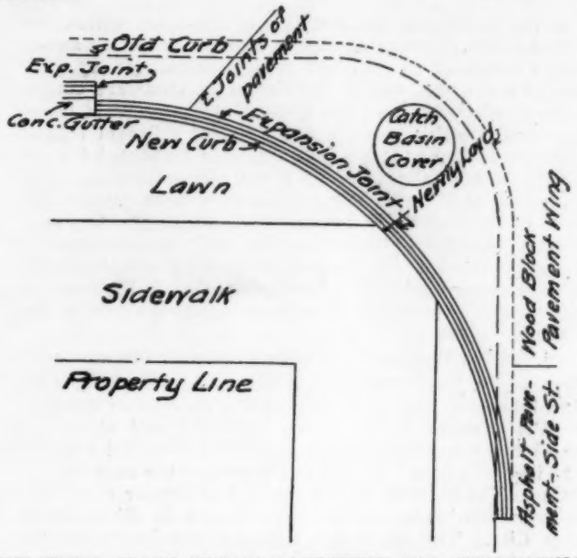
The width of Meridian street in Indianapolis north of Sixteenth street was fixed over twenty-five years ago. South of Sixteenth the street was improved a few years later and was made wider, as wide, in fact, as it could be without destroying the fine trees on both sides of the street. In some cases trees were saved by breaking the curb and surrounding the tree with a concrete curb projecting a short distance into the gutter.

The roadway north of Sixteenth street has become inadequate for the fast-moving traffic of today although two rows of vehicles can stand one at each curb and two vehicles could pass each other between them by going slowly and carefully. After two or three years of effort the street from Sixteenth to Twenty-fifth has been widened three feet on each side. Also a portion of the lower part of the street, from St. Clair to Tenth, is now largely devoted to business and it also has been widened about the same amount. The latter part of the pavement is a comparatively new wood block pavement, and the former part is an asphalt pavement, of various ages.

The first step in the widening was the changing or lowering of the conduits for the boulevard system of lighting and the setting of the new curb. Opportunity was taken to lay the curb with smoothly cut granite and to greatly increase the radius of curves at some of the street intersections. In some cases the old radius of six or eight feet was increased to twenty feet, where the width of sidewalk and the location of drainage channels permitted. At the same time the inlets to catch basins were reset to suit the slightly lower elevation of the gutters and the new positions of the curbs, inlets usually being set back from the curve of the corner. The conduits are under the new gutter.

Where the old pavement is asphalt, the space between it and the new curb is filled with brick laid flat on concrete foundation and with grout filler, the bricks being set with their length parallel to the curb. At alley intersections a gutter is formed of the brick so laid, the

alley wing being otherwise of the old asphalt. Where driveways are made into private property they are of concrete and are run down to the regular brick gutter. The return curves in such cases are made of concrete, connecting the straight granite curb of the street with the flush curb of the driveway where it crosses the cement sidewalk. The width of sidewalk and of lawn varies because the total width of street varies, but is usually sufficient to cause no break in the sidewalk on account of the driveway. Sidewalk and lawn together are from ten to fifteen feet wide, and width of new roadway is about 36 feet.



WIDENING WOOD BLOCK PAVEMENT AND INCREASING RADIUS OF CURB AT CORNER.

Where the old pavement is wood block, the street is wider and the pavement is wider, the widened pavement being about 42 feet. The expansion joint along the curb consists of four rows of blocks laid longitudinally with bitumen-filled joints. After the new curb was set, a concrete gutter was laid, 12 inches wide. The longitudinally laid wood blocks were taken up and cleaned, so far as they could be, and were good enough to be used again. They were relaid, using a considerable proportion of new blocks, and the two feet or so of space remaining was covered by carrying out the diagonal rows of the old pavement with new blocks until they were fitted to the side of the longitudinal rows.

Practically no patching of the asphalt was necessary, since the new space was filled with brick and the grout filler, and a few days' use removed all trace of the process of widening. The junction of new blocks with old in the wood block pavement is so well done that a few weeks of use will probably do the same for that portion of the work.

Several streets in Indianapolis have been widened to meet the increased demands of traffic or of the change from residence to business conditions. This seems to have been the widening easiest to make, due no doubt to the excellence of the method adopted. The problem arises frequently in the design of new streets where the future course of development is unknown, and the ease with which this widening was done suggests that the original design can be so made that if widening is ever necessary it can be done as in this case by extending the pavement either with the same material or with different material. The greatest expense is in the revision of the curb lines, and there is room for a design for a curb which can be used on such doubtful streets and reduce the cost of change if one becomes necessary.

HOLLAND WATER DEPARTMENT SELF-SUPPORTING.

Commencing with the fiscal year, 1917-18, the Water Department of Holland, Mich., has been self-supporting, as is the Light Department of that city. This is the result of the approval by common council, on February 21st, of the recommendation of the Board of Public Works that the city pay the Water Department for hydrant service or public fire protection, that department in turn to pay interest on outstanding indebtedness and the taxes that a private plant would pay, neither of which it has paid in the past.

The report for the fiscal year ending March 19th, 1917, shows credits and debits based upon hydrant service and interest and taxes, but merely as a matter of bookkeeping. In this account hydrant service is credited with $10,859.48, this amount having been arrived at by assuming a rate of $35 per hydrant per year. The department also charged itself with $1,859.60 taxes, and $2,437.50 interest on outstanding indebtedness; the sum charged as taxes being found by applying the rate of $11.77 against the value of the plant. The difference between the interest and taxes and the hydrant service was $6,562.32, which was the net amount owed by the city for hydrant service. On the other hand, however, $8,000 was turned over to the water fund from the general tax levy. The difference, or $1,437.38 is the net assistance given the department by the tax-payers.

In making out the annual statements for this plant, depreciation is calculated upon the following basis: Land, nothing; pumping stations, buildings and grounds, 2 per cent; boiler plant, buildings and grounds, 4 per cent; stand pipe and reservoir, fixtures and grounds, 3 per cent; pumping station equipment, at one station 4 per cent, and at two other stations, 5 per cent; boiler plant equipment, 5 per cent; wells, 6 per cent; general office equipment, 6 per cent: stores, department buildings, fixtures and grounds, 2 per cent; stores department equipment, 6 per cent; distributing mains, 2 per cent; hydrants, 2½ per cent; services, 2 per cent; meters, 5 per cent. The total investment at the close of the fiscal year amounted to $238,660.84, the depreciation during the year was calculated to be $5,671.76, and the value at the close of the year, $158,017.56.

The department calculated that the total operating revenue, including the amounts credited for hydrant and sprinkling service, was $37,613, the hydrant and sprinkling service being valued at 30 per cent of the total operating revenue. The operating expenses amounted to $14,709. To this was added the estimated depreciation (presumably in lieu of sinking fund) and the taxes brought the total up to $21,625, and this and the interest on outstanding indebtedness deducted from the total operating revenue left a net income of $13,694. Of this, $8,300 was used in redeeming bonds. The operating expenses plus taxes, interest and depreciation increased at a more or less uniform rate up to the year 1914, which marked a maximum, since which the operating expenses have fallen off nearly $4,000. The total operating revenue also has been increasing.

The population of Holland is about 12,000, of which about 21 per cent are consumers. The investment per 100 gallons capacity is $3.18; the total operating revenue per 1,000 gallons capacity was $5.01; the total operating revenue was $3.13; the net income per $100 invested was $5.73. The meter rates ranged from 10c per 100 cu. ft. maximum to a minimum of 4c for all over 300,000 cu. ft. used semi-annually. The minimum charged for six months ranges from $3.00 for a ⅝-inch meter to $70 for a six-inch meter. Ten per cent is allowed on all of the above for prompt payment.

The WEEK'S NEWS

Iowa Counties to Buy Cooperatively—The State Roads of Pennsylvania and New Jersey—Pennsylvania Health Board's Sanitary Crusade—The Waterworks of Akron and Oshkosh—Street Lighting Contracts in Wilkes-Barre and Menasha, Wis.—Restrain Utilites Commission from Reducing Rates—Making the Cantonment Cities Safe for Morality—Better Working Conditions for Boston Firemen—Anti-Litter Work in New York Successful—Evansville Buys a Coal Mine—The Weights and Measures Bureau of New York Stops Fraud.

ROADS AND PAVEMENTS

Co-operative Buying for County Highways.

Des Moines, Ia.—Thomas H. MacDonald, chief engineer of the state highway department, has offered to the county supervisors a solution of the problem of high prices and delayed deliveries of road materials next year. Much of the difficulty is attributed to the small quantities which each county buys and Mr. MacDonald's suggestion is that the supervisors' association appoint an executive committee of eleven members to buy co-operatively for all the counties in the state. Materials upon which the executive committee would receive lowest bids in large quantities would be lumber, reinforcing steel, cement, sand and gravel, but mainly the first three as their supply is far removed from the state. Under the proposed plan, counties would file their estimates early this fall for next year's needs. Then the committee for the state would procure the lowest possible estimates for lumber, steel and cement, in large quantities. The price thus obtained would be submitted to the individual boards, whose members could accept or reject them. Contracts for lumber and reinforcing steel, the engineer says, taken months ago, are in many instances still unfilled.

Freeing Toll Roads in Pennsylvania.

Harrisburg, Pa.—Since the state began in earnest, six years ago, to free the roads of tollgates, 197.07 miles of toll roads have been freed by the state and the local authorities. The state highway department believes that public sentiment has now reached a point where it is justified in going right ahead with the work of freeing every toll road in the commonwealth. Within a month 41.5 additional miles will be freed by the department, making the total mileage freed from the beginning of the campaign 233.57, or thirty-four per cent. of the total number of miles found under the old tollgate system in 1909. In summing up the present status of the department's work, commissioner Black pointed out that the appropriations that have been made to the department to be expended specially in the acquisition of toll roads has amounted to less than $1,000,000. These appropriations are: 1913, $100,000; 1915, $250,000; 1915 (deficiency), $24,000; 1917, $500,000. Pennsylvania's present total mileage of toll roads is 524.93. Of this mileage 394.58 is located on state highway routes. The state department has no authority to take over toll roads which are not located on state highway routes. Where roads for which tolls are charged are otherwise located the commissioners of the county in which such roads may be located may proceed by purchase or condemnation to take over toll roads, or any body of citizens desiring their abolition may institute proceedings for the condemnation of the road, in which case the county pays the price which may be fixed on the highway. The 1917 legislature passed an act which authorizes counties, townships, boroughs or incorporated towns in which toll roads are located on state highway routes to contribute such portion of the purchase price, or of the cost of condemnation proceedings, as may be agreed upon with the state highway commissioner. All of the counties in which toll roads are located on state highway routes have agreed to co-operate with commissioner Black on a fifty-fifty basis in freeing the county of toll roads. Berks, Lebanon and Dauphin Counties each will pay its proportionate share of the cost of the Berks-Dauphin turnpike, which will be taken over by the state department about September 1 at a cost of $70,000. The share to be borne by each county will be in proportion to the mileage of turnpike within the county's limits. Lancaster county now is conducting an aggressive campaign in an effort to abolish toll roads. Proceedings are under way in the courts of Delaware county for the condemnation of the Philadelphia and West Chester turnpike, which is eight and one-half miles in length. In Mifflin county proceedings have been instituted for the condemnation of the Lewistown and Kishacoquillas turnpike, which is 5.5 miles long. Westmoreland county has agreed to pay one-half of the cost of freeing the Donegal-Mount Pleasant township turnpike, and negotiations are nearing completion for its purchase at a cost of $10,000. With the passing of tolls on this turnpike, all highways in Pennsylvania west of the Allegheny Mountains will be free for public travel.

Plan Continuity of New Jersey Roads.

Trenton, N. J.—Declaring that the continuity of improved main highway routes is broken by the absence of connecting links through many towns, boroughs and cities, the state highway commission has appointed a special committee to investigate the subject and report at the next regular meeting. The committee is composed of former road commissioner Edwin A. Stevens and George E. Blakeslee of Jersey City. The resolution adopted sets forth that the continuation or connecting links of main highways are in deplorable condition in many municipalities. It will be the function of the committee to make specific recommendations as to some form of procedure that may be taken, either through the counties or directly with the lesser municipalities, looking toward the immediate construction of such connecting links as are needed to make continuous improved highways. Gen. Geo. W. Goethals was present at the meeting and received assignment of duties as chief engineer. He has submitted to the highway commission a report on the progress of the surveys being made under his direction for the new state road system. He shows that very considerable progress is being made on these surveys, but the work is hampered because not enough men can be obtained for laying out the roads. At present about fifty surveyors are engaged on the work. "In view of the fact that this department has been unable to get sufficient men for survey as rapidly as desired," he says, "it has been decided to change the methods, and to resort to reconaissance surveys for the larger parts of the routes. It is intended to complete the survey of routes Nos. 3 and 6 with the view of using the complete information of these two routes which will be typical of practically all the routes in South Jersey, as data for the other routes. All data available will be secured in order to get as close a cost of the system as possible." Route No. 3 extends from Camden to Atlantic City. On this route, General Goethals reports that a continuous alignment survey has been made of the entire length. Route No. 6 extends from Camden to Bridgeton and Salem. Starting at the southerly end, the survey has proceeded northwardly about 10 miles, and General Goethals says it should be completed the coming month. Cross sections of Route No. 3 have been completed for a distance of five miles from Absecon, and the profiles have been finished for the same distance. The mapping of this route has been completed for 3 miles. On Route No. 4 the survey has proceeded from Absecon, and the profiles have been finished for the same distance. The mapping of this route has been completed for 33 miles. On Route No. 4 the survey has proceeded from Absecon 12 miles north, the mapping being carried along with the field work. One of the interesting comments in the report is to the effect that the notorious

"hole in the wall" in South Amboy will be avoided, if possible, in the construction of Route No. 4. This route will extend from Rahway, where it will branch off of the route from Elizabeth to Trenton, to Perth Amboy, Red Bank, Asbury Park, Lakewood and Absecon. The "hole in the wall" is a tunnel under the tracks of the Pennsylvania Railroad in South Amboy, and it is so narrow that two vehicles cannot pass each other. It is a very dangerous spot, and for many years there has been waged an unsuccessful fight to eliminate it. Meanwhile mandatory orders have been sent out to the county tax boards by Frank D. Schroth, secretary of the state board of taxes and assessments, directing them to assess the tax of one mill on each dollar of real and personal property each year for five years for the road scheme. Some of the cities are continuing their plans to fight the tax. "This means," said commissioner J. Hosey Osborn, director of finance of Passaic, "that every atom of home rule has been taken away from us in this matter. Our tax rate is to go up about ten points for this contribution of $50,000 which has been levied upon us against our will and against our protest, and we are not even given a chance to fight. We had intended, if possible, to avoid this issue until another legislature had had opportunity at least to make the arrangement fairer to our communities. Therefore we had not included this $50,000 in the levy. Now we must raise the money. That's clear, under the order from Trenton. But whether or not we'll pay out the money is another question. Although the law requires us to pay over this $50,000 to the county collector out of the first moneys, on or before December 22 next, I certainly shall not pay it out until and unless every atom of doubt about the matter is cleared away." The cities want an injunction restraining the operation of the roads bill until the next session of the legislature.

SEWERAGE AND SANITATION

State Board Cleans Up Pennsylvania Boroughs.

Gettysburg, Pa.—State health commissioner Dixon, who is cleaning up the boroughs of the state whose boards of health are lax, took charge of the sanitary affairs of Gettysburg, where there are 7,000 to 8,000 regular army men encamped. In placing his own men in the borough commissioner Dixon made it clear that the board of health is not alone to blame, but the Borough Council, which has refused to furnish funds or ordinances for the board so that a general clean-up of very filthy conditions might be accomplished. A few weeks ago Dixon gave the local board of health two weeks in which to clean up the community. The members of council openly opposed the sanitary measures asked for, and several of them appeared at a mass-meeting to oppose suggested plans for cleaning up the fifty or so "piggeries" that are maintained within the borough's confines. The two principal troubles in the borough were found to be the filthy piggeries and the surface outhouses. The flies and mosquitoes were unusually numerous, due to the general insanitary conditions. The state tuberculosis dispensary was made the headquarters of the staff of Dr. Dixon's men. Chief medical inspector B. Franklin Royer, of Harrisburg, was put in charge. Five assistant engineers of the department tested water, and five special inspectors were sent to the borough. Edward Stewart, chief of the bureau of public service of the department of health, inspected hotels and restaurants. One restaurant was closed by Dr. Dixon a week ago. Five hundred sources of water supply were tested outside the borough, and 75 per cent of these were found polluted. These polluted springs and wells have been placarded. Colonel Nicholson, in charge of the battlefield, notified some of the assistant engineers that if they placarded any of the battlefield springs he would call the park police. The state health department obtained an opinion from the attorney general's department that the state has jurisdiction on the battleground. The sanitary cleanup is made not only for the army, but for the people of Gettysburg as well.

Eddystone, Pa.—Following investigation of insanitary conditions prevailing in Eddystone by health officer Thomas W. McCombs and Charles O. Struse, of the State Bureau of Housing, commissioner of health Dixon ordered the dismissal of the entire board of health of the borough. The deposed board was made up of Dr. A. D. Ferguson, James Atkinson, George W. Moore, Herman York, Walter Bryan and Charles Adams. Alfred Heisner was the health officer. That few inspections have been made of the twenty-five restaurants in the borough was admitted by the members. The law requires all employees to be examined twice a year, at which time he is presented with a certificate by the examiner, and the stub taken to the board of health to be filled out, certifying the employee has complied with the regulations. Few stubs were found. Eddystone has a settled population of about 7,000 inhabitants, but during the day is host to an army of nearly 25,000 workmen. To feed this army all kinds of eating houses have been opened, ranging from curbstone establishments to respectable hotels. Little care has been exercised in the selection of employees, and in some places it is charged that no attention has been paid to the quality of the food. Decomposed meats and vegetables and fly-ridden cakes, pies and bread are displayed for sale in some of the shops, but no official cognizance was taken of the irregularities. Employees suffering from skin disease and otherwise unfit for their positions, it is declared, handled the food in some of the restaurants. Friction between the borough council and the board of health increased the inaction of the latter body. Several weeks ago the health board purchased some signs giving notice of penalties for spitting on the sidewalk. The borough refused to pay for these, and the signs now repose in the firehouse. Residents charge the health officer ignored the presence of dead dogs, cats and other animals. Ash piles and garbage heaps close by dwellings, offensive in hot weather, also passed unnoticed they declare. Boarding houses, which include almost every dwelling in the borough, pack four to eight men in a room in certain instances, it is charge by residents, creating extreme unsanitary conditions. D. J. William Wood, of Chester, member of the county health board, and state officer Thomas McCombs, of this city, were put in charge of the health work. A stringent inspection was made, and all infractions met with severe penalties. The borough may be annexed to Chester.

Chester, Pa.—After the Eddystone cleanup, Dr. Dixon turned his attention to this city. In a letter to Benjamin D. Wright, superintendent of public safety, Dr. Dixon called the local officials to task specifying insanitary back alleys and standing water in many sections. Backyard wells and the lack of proper drainage systems are conditions which have met the disapproval of the health chief. It is reported that deputies from Dr. Dixon's office in Harrisburg have been working quietly in this city for the last few weeks, and have obtained much evidence that points to a careless administration of health department affairs. Dr. W. Knowles Evans, director of the department of health in this city, is at a military camp, and since his departure several weeks ago no successor has been named.

Industrial Hygiene Bureau for City.

Toledo, O.—The Toledo health department, under the direction of Dr. C. D. Selby, has established a new bureau of industrial hygiene in connection with the city health division in charge of Dr. Paul M. Holmes, of Columbus, formerly assistant physician in the Division of Industrial Hygiene of the Ohio State Department of Health. Dr. Holmes was selected by the trustees of Toledo University upon recommendation of Dr. Selby. He will make a survey of Toledo industrial concerns and cooperate with employers in the elimination of health hazards in industries. Toledo recently employed a public health instructor through whose activities the health division is gaining much valuable publicity.

Typhoid in Camp and Village.

Pompton Lakes, N. J.—The spread of typhoid fever through the camp of the Fifth New Jersey Infantry at Pompton Lakes, and in the village, was caused through the contamination of the drinking water and resulted in a score of cases and one death among the soldiers and villagers. Two tests were made by officials of the state board of health, Pompton Lakes board of health and Major Frank Y. Neer, of the Hospital Corps. One of the sources of contamination was found in an overflowing cesspool located

near the pumping station of the borough water supply system. The overflow of the cesspool leaked into the well. Aniline dye placed in the outhouse is said to have appeared in Well No. 1 within three minutes. The explanation was that it had seeped through a tile cracked in the du Pont explosion in January. The Pompton Lakes water comes from two wells. For the local board of health, S. H. B. Jacobs, a member of that body, who is also a member of the borough water committee in charge of the pumping station, said: "I refute absolutely the charge that conditions at the pumping station are responsible for the epidemic. It may be a contributory cause." Borough officials said that pollution probably occurred because of the proximity of the regimental latrines to the pumping station. They stand almost on the line of the water plant tract. A heavy rain that occurred July 22 could, it is claimed, have spread the seepage area of the latrines, and it is said to be significant that the outbreak appeared just fourteen days after that date, the exact period of incubation.

WATER SUPPLY

Expansion for Waterworks.

Akron, O.—Work is soon to begin on the extension of the city's water supply system to make it adequate for a population of 175,000. Cast iron pipe, filtration plant extension, pumping station and standpipe and valves and gates contracts have been let, $500,000 being spent on them. G. G. Dixon, waterworks engineer, said that the new pipe lines would help to relieve conditions all over the city. Laying the pipes will be started at once, and it is expected that the work will be completed before winter. New sand filters will be added to the present battery in the water pumping station near Kent, which will be capable of taking care of an additional 10,000,000 gallons daily. In order to give West Hill as good service as any other part of the city, a boosting station and a storage standpipe or tank will be placed at Sherbondy Hill. Some of this work is expected to be done by fall, but it will probably not be complete until spring. Contracts were let this spring for the enlargement of the Kent pumping station by the addition of a 10,000,000 high lift or 25,000,000 gallon low lift pump, and a steam power plant. The boilers must be installed by Oct. 6, 1917, and the pump by July 20, 1918. Already there are two pumps in the station, one with a capacity of 10,000,000 gallons, and the other 15,000,000 gallons. In the future the regular capacity of the plant will be 25,000,000 or 30,000,000 gallons daily, with one pump lying idle in case of a breakdown.

The West Virginia Water Supply Tests.

Charleston, W. V.—Mayo Tolman, engineer of the public service commission, has sent the following letter to Mayor J. Loyal Gilbert, of Parkersburg. The commission's report on the water supplies of 117 municipalities in the state had charged that many are unsafe and a decided protest from many cities followed its publication. The letter says: "No one can deprecate more than I the newspaper articles that have appeared as a result of this report. The inspectors averaged the results of all water samples from each town regardless of the source of these samples, and it was these averages that they gave to the newspapers. In other words the results represent a combination of tap samples and samples directly out of the Ohio River, and have no value whatsoever. I have gone over the results and find that instead of Parkersburg's water supply being unsafe 70 per cent of the time, as their results indicate, 16 per cent of the tap samples only have been unsafe and 16 per cent suspicious, making 32 per cent of the samples not up to standard. Some of the bad results are probably due to the length of time elapsing between the collection of the samples and their delivery by the express company at the hygienic laboratory at Morgantown. However, unfortunately, I do not find that the Parkersburg samples show quite as good results as Huntington and a few other towns who experienced the same long delays because of the express company. I would suggest that you can insure a water supply with a uniformly low bacterial content by increasing the dose of chlorine gas somewhat above the figure you are using at present. If I were you I would never permit your dose to be less than 3-10ths of a part of available chlorine in a million gallons of water, and it might be found wise to use as much as 35-100ths of a part. On the whole, Parkersburg has a very excellent water supply, and I think you have no cause to let the article which appeared in the newspapers occasion the slightest worry. Of course, I realize it is not pleasant to have a water supply put down as unsafe when you know it to be perfectly wholesome. Your city, however, has not suffered because of these articles as has the health department. According to the report as issued by the inspectors of the public service commission, after two years of effort the state department of health has secured but seven safe drinking water supplies out of 117 examined, which would show us to be a very inefficient body. As a matter of fact the very results which the inspectors used show that 60 per cent of West Virginia's drinking water supplies are probably safe for consumption."

New Filtration Plant Completed.

Oshkosh, Wis.—The new municipal filtration plant is about completed, according to T. B. Jorgensen, resident engineer in charge of construction, and as far as the structure is concerned the only thing left is the erection of interior fixtures (plumbing and electrical) and finishing touches on the several concrete basins, which are water-proofed on the inside after being thoroughly cleaned out to receive water for tests. The plant will be opened in about two months. "We have experienced considerable delay, which is no fault of any local contractor who has had anything to do with the structure," said Mr. Jorgensen. "The delay has been caused by the unreasonable time required in obtaining castings and equipment by the contractor for the appliances and accessories. The plant will accommodate six million gallons a day, and has six filter-beds each of a capacity of one million gallons. This plant is also provided, Mr. Jorgensen states, with a new aerating equipment of Col. Henry A. Allen's patent. The operating gallery, which is located on the first floor of the brick building, is in the center of the building between the filter-beds, three on each side. This gallery floor is covered with red tile, and there is a white glazed brick railing on each side of the gallery. Each filter-bed is controlled from a movable operating table located on the operating gallery. On the second floor of the brick building is located the laboratory, where the water will be analyzed every day and the application of chemicals will be adjusted as required by the water tests. The brick tower incloses a 50,000-gallon steel tank for water for the purpose of washing the sand in the filter-beds about once in twenty-four hours. This tower is also going to serve as a smokestack for a future pumping station, as a steel stack will be erected inside of tower and discharge through the brick stack in the roof, about 120 feet over the ground level. This design does away with the disfiguring feature of an ugly smokestack, and also eliminates additional expense. The water will be brought to the plant through two twenty-four-inch cast iron intake pipes. One of these connects into the old intake, and the other, which is now being placed, goes out into the lake 1,200 feet. The outer end of this is connected to a submerged concrete crib. The second intake pipe, which is going to be connected to the old intake, is already placed, with the exception of the connecting castings, which have been considerably delayed in their arrival.

STREET LIGHTING AND POWER

Commission Restrained from Rate Reduction.

Washington, D. C.—Justice Gould of the district supreme court has granted the application of the Potomac Electric Power company for a temporary injunction against the public utilities commission to prevent the enforcement of its order to reduce the price of electric current from 10 cents to 8 cents per kilowatt hour. The order of the court will restrain the commission pending final determination of the litigation. In order to protect the 30,000 consumers of electricity and to insure the return to them of the 20 per cent excess over the new rate adopted by the commission, justice Gould made it a condition of granting the injunction that the Potomac Electric Power company furnish security for the repayment to the consumer in the event that

the United States supreme court should finally uphold the rates adopted by the commission. The court also exacted from the power company the payment of interest at 6 per cent on the excess paid by the consumers. Justice Gould ruled against the contention of corporation counsel Syme that paragraph 63 of the utilities act takes away the injunctive powers of the court to restrain rates fixed by the commission. Such a construction as contended for by Mr. Syme, the court said, might "result in confiscation of the property of a public utility before a final decree could be obtained from the court of last resort. To deprive any person or corporation," said the court, "of the right to invoke the jurisdiction of equity to prevent such result would be simply taking property without due process of law." The court suggested that the paragraph was intended merely to put the burden of proof upon one assailing any order of the commission to show the unreasonableness of such order. After reviewing the bill and answer and the differences in valuations claimed, justice Gould pointed out that if the new rate should be held unreasonable by the United States supreme court and no temporary injunction had been issued preserving the status quo, the plaintiff would have been compelled to receive, during the pendency of the litigation, $350,000 less per annum than it would receive under its present contract rates with its consumers; and its only remedy would be to bring 30,000 separate suits against the individual consumers for 20 per cent of the present contract rate. In a very great number of cases the individual indebtedness would be so small as not to warrant filing suit, the court suggested; and death, bankruptcy, removal and other causes might entirely defeat recovery. On the other hand, should the commission's rate be upheld the conditions of the temporary injunction would secure to the consumer the return of any excess payments and little or no injury be inflicted.

Competitive Bidding Cuts Street Lighting Rates.

Wilkes-Barre, Pa.—Following a decision by the state superior court, denying a supersedeas to restrain competition approved by the public service commission, the Wilkes-Barre company was outbid on a contract to light the streets by the Wilkes-Barre Light Company, a new concern. The week before, the Welsbach company, which had had the contract for gas lighting for several years, was outbid by the Carroll company, recently organized by local citizens. Since the latter has no plant it is expected that the Welsbach company will be forced to sell its product to the new company. The contract with the Carroll company is estimated to save the city about $16,000 in five years. According to the bids of the Welsbach company and the Carroll company, the difference in bids for one year under the five year proposal is $3,070.35, the Carroll company bidding $14,768 for each year for lighting 341 gas lamps and the 174 naphtha standards, while the company that held the lighting contract here for the past seventeen years bid $17,838.35 for the same work.

The Carrol company's bid was as follows: For a one-year term—Lighting 341 gas lamps at $30 per lamp per year; 174 naphtha lamps at $32 per lamp per year. For a three-year term—Lighting 341 gas lamps at $29 per lamp per year; 174 naphtha lamps at $31 per lamp per year. For a five-year term—Lighting 341 gas lamps at $28 per lamp per year; 174 naphtha lamps at $30 per lamp per year.

The bid of the Welsbach Street Lighting Company of America was as follows: For a one-year term—Lighting 341 gas lamps at $30.60 per lamp per year; 174 naphtha lamps at $39 per lamp per year. For a three-year term—Lighting 341 lamps at $29.60 per lamp per year; 174 naphtha lamps at $45 per lamp per year. For a five-year term—Lighting 341 gas lamps at $29.35 per lamp per year; 174 naphtha lamps at $45 per lamp per year.

In the case of electric lighting, bids were received for three, five and seven-year periods. In lighting the city hall, police station, fire houses and other municipal buildings the two competing companies submitted the same bid.

The bidding was as follows: 400 candle power, 15 ampere, Type C Mazda lamps, inclosed in a good street service pendant fixture equipped with light diffusing globe and reflector yielding not less than 280 candle power. Wilkes-Barre company—For three years, $62 per lamp, per year; for five years, $54; for seven years, $50. Wilkes-Barre (New) Light Company—For three years, $42.50; for five years, $42; for seven years, $41.

600 candle, 20 ampere, Type C Mazda lamps, inclosed in a good street service pendant fixture equipped with light diffusing globe and reflector. Wilkes-Barre company—For three years, $65 per lamp per year; for five years, $58; for seven years, $54. Wilkes-Barre Light Company—For three years, $48.50; for five years, $48; for seven years, $47.

Alternating series inclosed arc lamps to consume not less than 7½ amperes of current at 72 volts. Wilkes-Barre company—For three years, $70; for five years, $63; for seven years, $57. Wilkes-Barre Light Company—For three years, $60; for five years, $49.75; for seven years, $49.50.

For furnishing light for police station, engine houses and all municipal building, both the old and the new companies submitted the same bids, that of 2½ cents per kilowatt.

For lighting and maintaining forty-two lamp standards equipped with five lights, each having four lamps of 60 watts each and one lamp of 100 watts, the Wilkes-Barre company bid as follows: For a three year term, $49; for five years, $46; for seven years, $45; the Wilkes-Barre Light Company bid: For three years, $39; for five years, $39.50; for seven years, $40.

For lighting Public Square standards of five lamps each of 100 watt Mazda the Wilkes-Barre company bid as follows: For three years, $37; for five years, $35; for seven years, $35. Wilkes-Barre Light Company, for three years, $35; for five years $34.50; for seven years, $34. These quotations are on the basis of the city maintaining the standards.

The awarded contracts mark the end of a long fight. About a year ago it was awarded to the old company in spite of its high bid. A petition of 4,000 tax payers of the city failed to prompt the county courts to force the city commissioners to an initiative or referendum. The highest state court was appealed to and an opinion rendered, forcing a mandamus through the lower courts upon the city officials to either rescind the contract entered with the Wilkes-Barre (old) company or submit the question to the voters at a special election. The first alternative was taken, the contract rescinded and bids again asked for. As a year ago, the new company outbid its competitor.

Lighting Contract Agreement After Long Fight.

Menasha, Wis.—Final steps in the well-known Menasha lighting case were taken when the mayor and city clerk were directed by council to enter into a contract with the Wisconsin Traction, Light, Heat & Power Company for a period of ten years with provision for the renewal of the contract for an additional period of ten years, providing that the municipal lighting plant of the city of Menasha be opened and operated for the purpose of furnishing electric current for light, heat and power within the city of Menasha, the capacity of the plant to be limited to five hundred kilowatts. It is further provided that the city of Menasha shall not furnish electric current to any user other than the city itself whose initial demand for current shall exceed ten horsepower and the city not to furnish any current to any user except itself, whose demand for current shall have increased to exceed twelve and one-half horsepower. All proceedings now pending before the railroad commission are to be discontinued and the city will make application to the commission for a certificate of convenience and necessity for the operation of the city plant.

FIRE AND POLICE

Moral Cleanup for Camp Cities.

Washington, D. C.—Secretary of War Baker has sent the following letter to mayors of all cities and towns in the neighborhood of National Army cantonments and National Guard camps and to the sheriffs of all counties in which or near which these camps or cantonments are located: "In anticipation of the military training camp soon to be opened in your neighborhood I am sending herewith a copy of the regulations recently issued on the question of the suppression of prostitution and the sale of alcohol to soldiers in uniform within a given radius of military posts and camps. These regulations, which are based on sections 12 and 13 of the recent Army law, do not, I believe, need comment, and I am confident that their enforcement will help create a wholesome environment about the military camps. There are one or two matters, however, in connection with the enforcement of the regulations to which I would like to call your attention. The regulations do not in any way lessen the necessity of police vigilance on the part of local authorities. The presence of large bodies of troops rather increases the responsibility of those whose duty it is to preserve local order, and I am confident that the War Department can rely on you to the utmost to see that the regulations are rigidly enforced. In the second place, while we have fixed a 5-mile radius about the camp in

which prostitution is strictly to be put down, the War Department will not tolerate evil resorts of any kind within easy reach of the camp, even though such resorts lie without the 5-mile zone. If places of bad repute spring up outside the 5-mile limit, but fairly accessible to the camp, I shall not hesitate to insist upon their elimination. Of course, it would be possible to extend the zone, and I shall not evade the responsibility in case of necessity. At the same time, if the zone is drawn with too large a radius there is danger that the number of soldiers required to police it will be beyond the ability of the commanding officer readily to furnish. In such a case, therefore, it might be easier and cheaper to move the camp to a more desirable locality; provided, of course, that clean conditions could not be secured through any other course. Finally, let me say that the War Department will not tolerate the existence of any restricted district within an effective radius of the camp. Experience has proved that such districts in the vicinity of army camps, no matter how conducted, are inevitably attended by unhappy consequences. The only practical policy which presents itself in relation to this problem is the policy of absolute repression, and I am confident that in taking this course the War Department has placed itself in line with the best thought and practice which modern police experience has developed. This policy involves, of course, constant vigilance on the part of the police, not only in eliminating regular houses of prostitution, but in checking the more or less clandestine class that walks the streets and is apt to frequent lodging houses and hotels. I have appointed a commission on training camp activities to advise with me on matters of this kind, and through this commission I shall keep constantly in touch with conditions about all our Army camps. If you have any questions relating to the enforcement of the inclosed regulations I trust you will not hesitate to get in touch with me or with Mr. Raymond B. Fosdick, chairman of the commission.

Des Moines, Ia.—The orders of secretary Baker have been effective in starting a thorough clean-up of disorderly women and bootleggers. Mayor MacVicar, who is himself an army officer, has returned from camp under special permission to finish up the crusade against vice. Mayor MacVicar has accused the police force of being not only derelict in performing its duties, but of containing disreputable characters. Superintendent of public safety Ben Woolgar and chief of police C. C. Jackson deny the charges and oppose the mayor's plans. The mayor gave out a list of disorderly houses. Many women have been fined and much liquor seized in raids.

Battle Creek, Mich.—Prosecuting attorney Adrian F. Cooper and his assistant, James Cleary, have been busy in a clean-up campaign to clear the city of some of its roughest elements before the men in the first draft come to Camp Custer. A free-lance squad worked for several evenings visiting disorderly houses and bringing captives to the jail. Many women were arraigned. Several negroes were arrested. The arrests will not end the clean-up campaign and condemnation proceedings will be started to do away with the property which is being used for immoral purposes.

Plattsburg, N. Y.—A visit by lieutenant-colonel Paul A Wolf, U. S. A., commanding the training camp officers' reserve corps, at the office of mayor Mooers resulted as follows: Chief of police was reduced and a new chief appointed. Nine saloons and one dance hall were closed. A licensing system for dance halls was effected, putting all under close supervision. Secret service men and welfare workers had been investigating Plattsburg and found conditions they demanded be removed.

Montgomery, Ala.—"If the people of this city do not support the effort of the attorney general to close up the houses of ill fame, we shall take pleasure in assisting to have the army camp moved from Montgomery." This was the declaration of assistant attorney-general Lawrence E. Brown made in chancery court during the hearing of injunction proceedings brought by the attorney-general against twenty-six women as alleged keepers of houses of ill fame, which cases were being tried en masse before judge Gaston Gunter on writs of demurrer and motions to dissolve the injunctions as brought by attorneys of the defendants several days after the injunctions had been granted temporarily. Judge C. P. McIntyre, counsel for the defendants, in a smoothly satirical reply, called the statement of the assistant attorney-general "poppy-cock" and said that if a decision was rendered in favor of the defendants he did not believe that the attorney-general and the assistant attorney-general would get on the train and go to Washington and ask secretary Baker to move the camp from Montgomery. Mr. McIntyre said that it was presumptuous for the attorney-general to bring these injunctions when there were United States officers to bring them and close the houses if they desired to do so. He characterized the action of the attorney-general in branding the women as keepers of houses of ill fame through an injunction with authority and without affidavit, as "infamous." Mayor Robinson has replied to secretary Baker explaining the peculiar operation of the law enforcing department of this city. He tells the war secretary that the police department is absolutely controlled by the board of safety, but that the city's commissioners try to punish offenders that are arrested by the police. He declares that the city commissioners wish to co-operate in every way in suppressing immoral conditions. He draws attention to the fact that the police jurisdiction extends only three miles beyond the city limits and that the police can make no arrests beyond that limit. He expressed confidence, however, that the county authorities would co-operate.

Hattiesburg, Miss.—The "red light" district which has flourished for twenty years in open violation of the laws of the state of Mississippi, but unhindered by either state, county or city authorities, has been wiped out after secretary Baker's orders. Some weeks ago chief Bennett and his men notified all the women in "the jungles" that Baker's orders were there should be no "district" in Forrest county. Most of the women left the city. Others may remain as long as they please, but policemen will be stationed near their houses to see that no men enter. For some months now there have been but three houses of ill-fame in operation. Before the panic of 1907 there were probably a dozen.

Terre Haute, Ind.—When colonel E. M. Lewis and the army officers were inspecting sites for camps and visited this city, at a banquet, three hundred representative citizens stood up and gave their pledge that they would regulate the saloons and wipe out the "red light" district. They are now keeping their promise, despite opposition of the mayor and other city officials. William Horsley, prosecuting attorney, has been forced to take stringent measures. He has given out a list of disorderly houses and the names of their owners. The co-called abatement law of the state is to be enforced against these property owners. Acting mayor Charles Mancourt gave orders to clear the city and all houses appear to have been closed. Most women have left. The disorderly district here was one of the worst in the country.

"One-Day-in-Three" for Boston Firemen.

Boston, Mass.—Beginning Feb. 1, next year, members of the Boston fire department will work only two days out of three, as against four days out of five as at present. An amendment to the city ordinances has been passed by the city council by a vote of 6 to 3. For more than a year the firemen and their friends have attempted to secure passage of this so-called "one-day-in-three" ordinance. Last year, and again this summer, public hearings were held. Councilor Hagan declared that certain of the six men voting in favor of the ordinance were acting through fear that votes of the Russell club and of the firemen in general would be used against them. "I know that they are a weight and a power," he declared. "I knew it a year ago, when I voted against this ordinance and when I was told that I was blacklisted by them and that my personal business would suffer, and I know it now. I have no fear of the Russell club, which the fire commissioner has called an insidious organization within the department, and which is causing trouble, insubordination, chaos and inefficiency." President Storrow made a motion to defer action on the ordinance

until 60 days after the close of the war. He quoted commissioner Grady's statement that at least 192 men must be added when the ordinance goes into effect.

GOVERNMENT AND FINANCE

Public Service Commission Will Help City.

New York, N. Y.—The Public Service Commission for the First District announces that it will hereafter participate actively through its counsel, in proceedings before the Interstate Commerce Commission which involve freight and passenger rates vitally affecting the public interest of the city of New York. Many cases greatly affecting freight rates of, and thus the cost of commodities largely used in New York city, are heard each year by the commission at Washington, merely as an issue between shippers and railroads, without representation of the public point of view and the public interests. The commission will therefore hereafter undertake to fulfill the duty of expertly representing the public interests of the people and shippers of the city.

Legislature Gives City New Charter.

Rome, Ga.—The bill amending the city charter has passed both the senate and house, and has been signed by governor Dorsey. Before becoming operative, however, the bill will be submitted to a vote of the qualified electors of the city of Rome. It provides that the first commissioner shall, at the expiration of thirty days, call a special election. Under the charter the election must be held not less than twenty nor more than thirty days from the date of call and it will therefore probably be held at some time between the beginning and middle of October. There are many important changes in the city government proposed by the charter amendment. Among them are the following: Makes seven directors instead of five commissioners. Fixes salary of each director at $200 per annum. Makes salary of chairman of directors $500 a year, instead of $3,900, as first commissioner now receives. It names Arrington, Holbrook, Jones, Lindsey, C. Terhune and C. O. Walden as first board of directors, with D. W. Simmons as first chairman, to serve until April 1, 1918. After that, seven directors, one from each ward, are to be elected for two year terms. Directors elect one of their number as chairman. Directors elect secretary, three tax assessors, sexton and auditor. People elect city attorney, recorder and city physician. All other city employees and officers are placed under civil service rules and they are appointed and their salaries fixed by a civil service board consisting of J. H. O'Neill, John M. Graham, H. R. McClatchey, J. D. McCartney and J. M. Bradshaw. The civil service board receives no salary. Provides for selection of city depository upon competitive bid for interest upon deposits. Abolishes offices of sanitary inspector and tax receiver. Places duty of sanitary inspector upon chief of police. Provides numerous rules for civil service in various city departments. Makes recorder turn into city treasury costs received in cases where he binds defendants over to state courts.

STREET CLEANING AND REFUSE DISPOSAL

City Incinerator Profitable.

San Jose, Cal.—The city incinerator is an efficient institution, according to reports brought to the office of the city manager. During the past five months, in which an accurate account has been kept of the cost of operation, it has been found that the expense is $6.28 per day. The cost of burning the refuse is $.447 per ton. The cost of labor and fuel for the five months is $807.85. The city receives $300 a month in garbage collection licenses, making the income for the five months $1,500. While there are incidentals in the running expenses which are not included in the labor and fuel costs, the incinerator is decidedly a money-making institution. The incinerator not only disposes of all the garbage and refuse of San Jose, but it serves as an animal crematory as well. Many dead dogs, cats and horses have been disposed of. Engineer Hunt states that there is no odor from the plant. Seventy per cent of the property owners and residents of this city, however, do not patronize the garbage wagons, according to a statement by city manager Reed to the city council during the report of the special investigation conducted by his office into the business methods of the San Jose Scavenger company. Manager Reed said that a number of houses where the occupants dispose of their garbage by means other than the public incinerator were found to throw the edible portions out to chickens, and that from a close canvass of certain streets it was obvious that the neglect to do away with the refuse according to law amounted almost to a complete boycott of the above company's accommodations. Chauncey Tramutolo, counsel for the scavenger company, explained that he was present to show that the concern was in no way responsible for the neglect, and to correct if possible the charge made by the investigators that the books of the company were not complete in reference to addresses of customers. He declared that the scavengers had not been told of the conditions governing their business; that the reason some of the wagons were out later than was allowed by law was because many of the stores were late in closing, delaying the gathering of garbage. City manager Reed showed that the number of houses not visited by a garbage wagon in this city ranged from 21 per cent to 94 per cent on the different streets. City manager Reed explained that if each family would pay 20 cents a month for the collection of its garbage the city could be kept clean. He said that the present price of 35 cents did not meet popular approval, but admitted that the men did not receive the pay that they deserved for doing this class of work, averaging from $75 to $80 a month. Upon the suggestion of the city manager, it was decided to call a conference of the health board, city engineer and city attorney to draw up a revision of the present scavenger ordinance.

Increase Garbage Collection Charge.

Lansing, Mich.—Lansing's garbage collection is to be operated under a new ordinance calling for the annual charge of $1 instead of the coupon charge of 10 cents a week. The new ordinance was adopted by a nine to six vote by the aldermen. The measure was backed by mayor Reutter. The ordinance prior to the adoption of the 10 cents a week charge called for $1 a year. A refund is to be made to coupon holders. Alderman Ferle fought against the adoption of any collection system which would be a direct expense to the people. He said that the people had voted for a free collection of garbage and that for this purpose $21,000 had been raised. There is a possibility expressed by the mayor of a change being made in the management of the collection. The present manager, William Gilkey, is required to give his attention both to the garbage collection and to the city piggery. The department has found that its chief trouble has been retaining its labor. The city has bought 2,000 new cans at $1.40 each, a number of which are already in service. The mayor expressed the opinion that the city would in a short time purchase an additional truck to aid in the collection. He expects to secure a large profit for the city through the piggery.

The High Cost of Litter.

New York, N. Y.—In an effort to save the city $25,000 a year by preventing littering of the public parks, the Anti-Litter League has called for boys and girls, as well as for their fathers and mothers, to act as "block captains" to report all persons who throw newspapers or other refuse on the lawns in public parks or in the streets when receptacles are furnished for all refuse. Speaking of the work of the league in aiding the park department, commissioner Ward said: "The question of litter has a very direct ratio on the amount of taxation. It is a matter of $18,000 if we could get less littering in the parks. This can be done by means of such a splendid organization as the Anti-Litter League. We find the litter question very serious in the park department. A survey of other cities disclosed the fact that in such cities as Chicago the littering is not such a problem as it is here. We found the average littering of the parks

in St. Louis much less than it is here, and that if the same ratio of cleanness were maintained here we would spend $22,000 less every year on the one item of picking up papers and other refuse. Here we have visited schools to talk upon the seriousness of littering the parks, and the result was encouraging. We put up to the hundreds of organizations holding celebrations in the parks the responsibility of organizing their forces and picking up after they had finished. We refused to grant permits again to organizations that failed to do this. We found an extraordinary amount of littering in the small parks. Numbers of people carry out their rubbish in cans and dump it in the park and go away rejoicing. The Anti-Litter League also sends out instructions for aiding in the prevention of disease by keeping the streets clean, especially in hot weather, when such diseases as infantile paralysis may be transmitted easily. "Don't cast litter into the streets," says the league. "It is worse than 'casting pearls before swine.' It is simple and easy, dignified and thoughtful to place your discarded newspaper into a city-maintained receptacle. 'Can it all.'"

MISCELLANEOUS

City Buys Coal Mine.

Evansville, Ind.—Mayor Bosse has secured leases on 640 acres of coal land lying between the E. S. &. N. traction line and the Southern railway, between Chandler and Boonville. In a short time this tract will have a coal mine producing 1,000 tons daily. It will be a municipal coal mine and will be used to supply the local market at a reasonable price. If the mayor's scheme works out, the mine will be managed by the water works department. Howard Durbin, superintendent of the water works, has written to the state public service commission asking the right to manage the coal mine. If the public service commission cannot give the permission, mayor Bosse will ask the governor to call a special session of the legislature so a law could be passed allowing cities to manage coal mines. If the public service commission cannot allow the water works department to issue securities on the mine and no provision is made by the legislature, the mayor will manage the mine as a private undertaking and will keep the price down within reason. The vein of coal on the tract secured by mayor Bosse is at a depth of 80 feet and from 5 to 7 feet wide, averaging 6 feet. At a depth of 250 feet there is another vein. The proposition will require $50,000 and the mayor will get this money himself, putting up private collateral. This will sink the shaft and build the tipple. A start will be made with pick mining. Walter Korff will have charge of the mine. After the mayor has started the mine he wants the water department to take it over and pay for it in instalments, then put in more money and make it up-to-date, with electric appliances, trucks, etc. The coal will not be sold at bare cost, but the mine will be run on business lines, just as the water works is. The mine is close enough to the city that motor trucks could be used for transportation in case of necessity. The mayor may ask the E. S. & N. and the Public Utilities company to co-operate in hauling it to all parts of the city over the electric lines.

Effective Work of Weights and Measures Bureau.

New York, N. Y.—Joseph Hartigan, who recently retired as commissioner of the Mayor's Bureau of Weights and Measures, says in a summary of the accomplishments of the bureau since he took office on May 1, 1914, that it "would be distinctly unfortunate to the people of the city to consolidate the bureau with any other department. There is no more wholesome force for trade honesty in the city than that of this bureau. It is so intimately in touch with the factory, store and home that it assumes a protectorate over the community pocketbook. It is essentially a 'people's bureau,' and has been conducted by me to do that primary service." Some of the bureau's many accomplishments during the past three years and three months, as pointed out in the summary, are as follows:

The enforcement of the net weight on containers law and its compliance with by 85,000 dealers in all character of commodities sold in containers.

Co-operation with the New York State Department of Weights and Measures in the successful criminal prosecution of wholesale packers of wrapped hams and bacons, resulting, the commissioner says, in a saving to retailers and consumers of this city of approximately $1,200,000 yearly.

Enforcement of the state and city coal law against wholesale and retail dealers in coal and obtaining evidence of short weight upon which the city and state collected penalties through the civil and criminal courts. Jail sentences invariably accompanied those offenders who dealt with the poor.

The discovery and disruption of a professional syndicate of persons who controlled 1,000 of the 15,000 coal, wood and ice cellars by levying tribute of $1 on each place daily, with intent to defraud the alleged proprietors, who saddled the extra cost on the poor who patronized such dealers.

Successful criminal prosecution under state law of dealers in jewelry and precious stones who practiced fraud on gullible customers by representing and obtaining money for fictitious and false values in weight and quality.

In an effort to correct conditions as to a true representation of the weight of bread the bureau made repeated and persistent attempts to enforce and prosecute under state laws and city ordinances and finally secured the co-operation of the manufacturing bakers to obtain a compliance with the law, which subsequently was nullified by action of the appellate courts.

The abuses of overfeeding and overcropping of live poultry with a view to increasing their weight artificially, both in transit and at receiving terminals, were eliminated as the result of the bureau's action in bringing prosecutions and by its educational activities among the men in the live poultry trade.

The bureau's new methods in its co-operation with the department of street cleaning, in the removal of snow—the bureau measures all vehicles used in hauling snow—protected the city in three years against losses of approximately $20,000.

LEGAL NOTES

A Summary and Notes of Recent Decisions—Rulings of Interest to Municipalities

Bids for Street Work—Accuracy of Estimate.

(N. J.) In soliciting bids for general repair work on city streets, it is impossible to state accurately all work to be done, and it is sufficient if conditions be stated as definitely as practicable.—Devlin v. Jersey City, 100 A. 208.

Repairing Streets—Definiteness of Contract.

(N. J.) A contract for repairing city streets need not define all work to be done, streets to be paved, etc., since this must necessarily be left to the city's judgment.—Devlin v. Jersey City, 100 A. D. 208.

Ordinance—Resolution—Distinction.

(Ga. App.) The distinction between an ordinance and a resolution is usually considered to be that, while a resolution deals with matters of special or temporary character, an ordinance prescribes some permanent rule of government.—City of Rome v. Reese, 91 S. E. 880.

Bid Higher Than Appropriation—Procedure.

(N. Y. Sup.) A bid for the construction of a building for a city in excess of the appropriation existing at the time is invalid, and when the appropriation is increased a new advertisement and reletting becomes necessary.—Klinck v. Pounds, 163 N. Y. S. 1008.

Drainage System—Best Design—Decision

(Tex. Civ. App.) Where the proper authorites of a city have determined that a proposed system of drainage is necessary, the question whether such system is the most feasible or the least expensive cannot be considered by the courts.—City Com'rs of Port Arthur v. Faint, 193 S. W. 334.

Fire Engines—Restricting Specifications.

(N. J. Sup.) The adoption of specifications for fire engines does not restrict competition so as to invalidate contract for their purchase, where all manufacurers could construct machines in accordance with the specifications, though one was equipped to construct them at less expense than others.—Bauer v. Town of West Hoboken, 100 A. 223.

Accepting Part of Street—Liability for Defects.

(Va.) Whether a municipal corporation accepted part of a street so as to be liable for defects in it, was made a jury question, where Acts 1906, c. 76, incorporating the town, referred to a map prepared by its council pursuant to Code 1904, § 1014, and the town had done some repairing on such portion of the street.—Town of Virginia Beach v. Ogle, 91 S. E. 747.

Power to Discontinue Streets—Source.

(N. Y. Sup.) The Legislature has the right to invest, as it did by Rochester City Charter, §§111, 121, the common council with power to discontinue streets.—In re Joiner St. in City of Rochester, 164 N. Y. S. 272.

Maintaining Streets—Obligation.

(N. J.) The obligation under a maintenance bond for repairing city streets, and where exact amount of work cannot be specified in contract, will depend on amount of work done.—Devlin v. Jersey City, 100 A. 208.

Establishing Alley—Prescription.

(Mich.) An alley may be established by prescription, although the landowner had no actual notice of the user, provided he should have known of it.—Village of Manchester v. Clarkson, 162 N. W. 115.

"Stone" Walks—Concrete.

(Miss.) Under a city charter conferring power to provide for building of walks with "stone," etc., walks may be ordered built of concrete, composed of gravel, Portland cement, and sand.—City of Vicksburg v. Robinson, 74 So. 617.

Maintenance—When Necessary.

(Md.) In absence of fraud or bad faith, the courts will not review a municipal corporation's determination that paving and drainage repairs are necessary.—Johns Hopkins Club Bldg. Co. of Baltimore City v. City of Baltimore, 100 A. 298.

Abolition of Office—Emoluments.

(Ga. App.) If the abolition of plaintiff's existing municipal office by the succeeding city commission was invalid, and plaintiff in good faith was willing to perform its duties, he was entitled to its emoluments.—City of Rome v. Reese, 91 S. E. 880.

Power to Discontinue Streets—Payment for Damages.

(N. Y. Sup.) Where its charter authorized a municipality to discontinue streets, an ordinance discontinuing streets to furnish station facilities for railroad companies is valid; ample provision being made for the payment of private damages suffered.—In re Joiner St. in City of Rochester, 164 N. Y. S. 272.

Sewer System—Description.

(Ill.) A proposed sewer system for village of 2,500 inhabitants is no less local improvement because it is proposed within the village to connect with another and private sewer, where no such connection outside village limits was intended.—Village of Bradley v. New York Cent. R. Co., 115 N. E. 640.

Unauthorized Agent—Liability of Municipality.

(N. J.) A municipal corporation may be liable for work done and materials furnished it on the order of an unauthorized agent, when the contract for such supplies is one that is within the scope of its corporate powers.—Frank v. Board of Education of Jersey City, 100 A. 211.

Disqualifications for Office.

(Pa.) Where Act March 31, 1860 (P. L. 400) § 66, and Act May 28, 1907 (P. L. 262), prescribe certain disqualifications for office of councilman, he must get rid of them before he is appointed or elected; but, if law merely forbids him to hold office, it is sufficient if he qualifies before he is sworn. Commonwealth v. Kelly, 100 A. 272.

Police Power—Reasonability of Ordinance.

(Cal. App.) Ordinance of city of Venice prohibiting in any public or uninclosed place playing a musical instrument, making loud noise, calling out goods or attractive features of amusement, etc., without permit, held void as unreasonable.—Ex parte Wisner, 163 P. 868; ex parte Messenheimer, Id. 869.

Initiative—Election—Validity.

(Okla.) Where initiative was filed with city clerk for enactment of ordinance, and the next day the mayor called an election on date other than next city election at which city officers were elected without submitting it to council, and without council's order of special election thereon, ordinance was illegally submitted, and election was void.—Ex parte Griggs, 163 P. 325.

Right to Use Sidewalk for Loading and Unloading.

(Ala.) An abutting property owner has the right to use the sidewalk in front of his premises when reasonably necessary for loading and unloading his goods and merchandise.—Walker v. John Smith, T. 74 So. 451.

Constructing Sewer—Assessments.

(Ill.) If proposed sewer system can be constructed within estimate and no property is assessed more than it will be benefited, construction cannot be said to be unjust or oppressive.—Village of Bradley v. New York Cent. R. Co., 115 N. E. 640.

Purchase of Engine—Payment by Taxes.

(N. J. Sup.) Act April 15, 1911 (P. L. p. 224), as amended March 28, 1912, (P. L. p. 358), did not deprive a town council of its power under Act March 7, 1895, (P.L. 218), §§47, 52, to contract for a fire engine and pay for it by taxes for one year.—Bauer v. Town of West Hoboken, 100 A. 223.

Removal from Office—Vacancy.

(Pa.) Although Borough Act May 14, 1915, (P. L. 312), does not specifically provide that councilman's removal from the borough shall leave a vacancy in his office, yet where facts disclose a removal, and an actual abandonment of office, a vacancy is created.—Commonwealth v. Kelly, 100 A. 272.

Compensation for Extra Work.

(Wis.) A municipal contractor is not entitled to recover compensation for alleged extras where price therefor was not agreed upon in writing before he performed work and claim was not presented to city within 14 days from time alleged items of expense were incurred. Thomsen v. City of Kenosha, 161 N. W. 735.

Assessments—Reasonability.

(Mo.) Where it appears that an assessment for present benefits from a main sewer is reasonable, the construction will not be enjoined because a future assessment for laterals, together with the assessment for the main, might exceed the present value of the land.—Whitsett v. City of Carthage, 193 S. W. 21.

Bonds for Filter Plant—Vote.

Ohio—Municipal corporation issuing bonds to provide for filtration plant in compliance with orders of state board of health may issue the full issue of 5 per cent. in any one fiscal year without submission to vote of electors.—State v. Dean, 116 N. E. 37.

Maintaining Street—Contract.

Florida—Contract for maintenance of paving in city street should not be construed to deprive city of its right to change character of pavement to meet new conditions, when contract may be so construed as to preserve city's governmental rights.—Manley-Stearns Const. Co. v. City of Miami, 75 So. 27.

Power of City Board of Health.

New York Sup.—City board of health has power to enact sanitary ordinance having force of law within its juridiction and has summary powers to protect people of community against unsanitary conditions.—Mannix v. Frost, 164 N. Y. S. 1050.

Leasing Public Building—Injunction.

Minnesota—A citizen and taxpayer may not enjoin municipal officers from leasing a building not needed for public use, unless the municipality and its officers are acting ultra vires and such acts may injuriously affect his rights.—Anderson v. City of Montevideo, 162 N. W. 1073.

Storing Volatile Oil—Regulations of Garages.

New York—Regulation adopted by former municipal explosives commission of city of New York, made part of Code of Ordinances by Laws 1911, c. 899, amending charter by adding section 778c, later amended by Laws 1914, c. 495, which regulation provided no garage permit, authorizing storage of volatile oil, should be issued for premises without separator, preventing escape to sewer, was not void ordinance, so that legislative adoption of it did not give it force of statute.—Stubbe v. Adamson, 116 N. E. 372, 220 N. Y. 459.

NEWS OF THE SOCIETIES

Calendar of Meetings.

Sept. 10-12.—AMERICAN CHEMICAL SOCIETY. Fifty-fifth annual convention, Boston, Mass.

Sept. 10-15.—NATIONAL EXPOSITION OF SAFETY AND SANITATION. Annual conference, New York, N. Y. Secretary, W. C. Cameron, Continental and Commercial Bank building, Chicago, Ill.

Sept. 11-13.—AMERICAN ASSOCIATION OF PARK SUPERINTENDENTS. Annual convention, St. Louis, Mo. Secretary, Roland W. Cotterill, 533 City Hall, Seattle, Wash.

Sept. 11-14.—INTERNATIONAL ASSOCIATION OF MUNICIPAL ELECTRICIANS. Annual convention, Niagara Falls, N. Y. Secretary, Clarence R. George, Houston, Tex.

Sept. 11-14.—NEW ENGLAND WATERWORKS ASSOCIATION. Annual convention, Hartford, Conn. Secretary, Willard Kent, 715 Tremont Temple, Boston, Mass.

Sept. 18-20.—LEAGUE OF IOWA MUNICIPALITIES. Annual convention, Iowa City. Secretary, Frank G. Pierce, Marshalltown, Ia.

Sept. 18-20.—LEAGUE OF VIRGINIA MUNICIPALITIES. Annual convention, Lynchburg, Va. Secretary, L. C. Brinson, Portsmouth, Va.

Sept. 24-29.—LEAGUE OF CALIFORNIA MUNICIPALITIES. Annual convention, Santa Rosa, Cal. Secretary, Wm. J. Locke, Pacific Building, San Francisco, Cal.

Sept. 24-29.—THIRD NATIONAL EXPOSITION OF CHEMICAL INDUSTRIES. Exposition, Grand Central Palace, New York City.

Sept. 25-27.—SMOKE PREVENTION ASSOCIATION. Annual convention, Columbus, O. Secretary, Frank A. Chambers, City Hall, Chicago, Ill.

Sept. 27-29.—AMERICAN AND CANADIAN ENGINEERS AND ARCHITECTS OF NORWEGIAN BIRTH OR DESCENT. Informal congress and re-union, Chicago Norske Klub, Chicago, Ill. Chairman, Committee on Arrangements, Joachim G. Giaver, consulting engineer, Chicago, Ill.

Oct. 15-17.—NATIONAL HOUSING ASSOCIATION. Annual conference, Hotel La Salle, Chicago, Ill. Secretary, Lawrence Veiller, 105 East 22d St., New York City.

Oct. 16-19.—LEAGUE OF KANSAS MUNICIPALITIES. Annual convention, Wichita, Kan. Secretary, Homer Talbot, University of Kansas, Lawrence, Kan.

Oct. 17-18.—LEAGUE OF MINNESOTA MUNICIPALITIES. Fifth annual convention, St. Cloud, Minn. Secretary-treasurer, Richard R. Price, University of Minnesota, Minneapolis.

Oct. 22-24.—AMERICAN CIVIC ASSOCIATION. Annual meeting, St. Louis, Mo. Secretary, Richard B. Watrous, 914 Union Trust building, Washington, D. C.

Oct. 28-30.—TEXAS CONFERENCE ON SOCIAL WELFARE. Annual convention, Houston, Texas.

Nov. 19-24.—CITY MANAGERS' ASSOCIATION. Annual meeting, Detroit, Mich. Secretary, W. L. Miller, City Manager, St. Augustine, Fla.

Nov. 20-23.—PLAYGROUND AND RECREATION ASSOCIATION OF AMERICA. Recreation Congress, Milwaukee, Wis. Secretary, H. S. Braucher, 1 Madison Ave., New York, N. Y.

Nov. 21-24.—NATIONAL MUNICIPAL LEAGUE. Twenty-third annual meeting, Hotel Statler, Detroit, Mich. Secretary, Clinton Rogers Woodruff, 703 North American Bldg., Philadelphia, Pa.

Jan. 15-17.—VIRGINIA GOOD ROADS ASSOCIATION. Seventh annual convention, Richmond, Va. Secretary, C. B. Scott, Richmond, Va.

Feb. 6-13.—FIRST CHICAGO CEMENT MACHINERY AND BUILDING SHOW. Supersedes annual Chicago Cement Show. Held at the Coliseum, under direction of the National Exhibition Co.

Kansas Good Roads Association.

J. Frank Smith, president of the Kansas Good Roads Association, announces the following program for good roads day at the Kansas Free Fair, Topeka, Wednesday, September 12. The meeting will be held in the big pavilion at the fair grounds, beginning at 10 a. m.

Address by L. F. Davidson Glasco, Kan., director Midland trail, "How and When to Pave the Midland Trail."

Address by W. H. Crawford Horton, Kan., "The Horton-Holton-Topeka Scranton Highway Should Be Paved. Let's Pave It Now."

Address by W. W. Watson, Salina, president Meridian Road, 'What We Are Doing and Expect to Do on Our Trail."

Address by W. S. Gearhart, state highway engineer, "What Type of Road to Build in Kansas."

Address by E. R. Moses Great Bend, state highway commissioner, "Federal Aid."

Texas Conference on Social Welfare.

The State Conference of Social Welfare will meet in Houston October 28, 29 and 30 to discuss social problems facing the state of Texas. This year on account of the increased social work the war has brought on and the new activities that are being started in connection with the four encampments in this state, there is expected an unusually large meeting.

The program has been outlined to cover the most important social questions confronting Texas, and prominent social workers from all over the state will take charge of the section meetings and secure speakers for them.

For the evening meetings some of the best speakers on social questions in the United States will be brought. Three have been invited, but there has not been time yet to hear from them.

The full program, with the names of the speakers and section chairmen, will be published as soon as possible. The program as now outlined follows:

Sunday, October 28: Opening meeting 3.30 p. m., banquet hall, city auditorium. Invocation. Welcome by mayor. President's address. Challenge of a Changing Social Order.

Monday, October 29: Appointment of nominating, time and place, resolutions committees, by president. 9.30 a. m. family problems, volunteers, desertion, illegitimacy, intemperance, etc. 11 a. m., health. Anti-tuberculosis, public health nursing, social hygiene, feeblemindedness and insanity, municipal sanitation. Luncheon—Organizing the community, city departments of public welfare, finance, federations, social centers, organizing small communities, church co-operation, training schools for social service, councils of social agencies. 2.30 p. m., business meeting. Future Possibilities of the Conference. Election of officers. 4 p. m., Trip to Social Service Bureau Neighborhood houses. 8 p. m., The War and Social Work. Social Work of the Encampments.

Tuesday, October 30: 9.30 a. m., Social Problems of the War, civilian relief, Red Cross work, recreational work. 11 a. m., child welfare, juvenile court, mothers' pensions, maternity homes, child placing agencies, street and messenger work, humane societies. Luncheon—Correction and reform, industrial problems, employment and vocational training, handicapped men, social insurance, child labor, industrial safety. 2.30 p. m., negro problems. 4 p. m., trips to Girls' School, Boys' School, Faith Home, Baptist Day Nursery, Municipal Farm. 8 p. m., a state program for child welfare. Adjournment.

The committee in charge of Houston arrangements consists of representatives from the Houston Foundation, Chamber of Commerce, Rotary Club, Young Women's Business League, Young Men's Business League, Houston Social Service Bureau and the Texas School of Civics and Philanthropy.

Western Pennsylvania Firemen's Association.

The Western Pennsylvania Firemen's Association at its recent meeting at Irwin elected the following officers: President, William E. Debolt, of Connellsville; vice-president, G. H. Bohland, of West Homestead, Thomas W. King, of East McKeesport, and Peter O'Brien, of Swissvale; secretary, W. H. Sharah, of Braddock; treasurer, James H. Steel, of Wilkinsburg; delegate to the state convention at Butler, Quay R. Hewitt, of Punxsutawney. Meyersdale was chosen as the place of meeting in 1918.

Massachusetts Firemen's Association.

At the annual meeting of the association held at Springfield, Aug. 13 and 14, officers were elected as follows: President, John J. Kelly, of Lawrence; first vice-president, James J. McNish, of Chicopee Falls; second vice-president, J. M. Gallaghan, of Taunton; third vice-president, J. M. Mahoney, of New Bedford; secretary, Thomas J. Powers, of Worcester; treasurer, E. A. Slattery, of Fitchburg; board of directors, F. H. Gould, of Boston; T. J. Doherty, of Holyoke; Thomas Burke, of Fall River; J. E. Hickey, of Salem; J. L. Parker, of Brockton; John L. Day, of Lynn; E. A. Walsh, of Springfield; J. E. Manning, of Pittsfield; M. Joseph Manning, of Milton.

Virginia Police Chiefs' Association.

The Virginia Police Chiefs' Association, in convention at Newport News, Aug. 15, refused to request the passage of a search and seizure law, selected Roanoke as next years place of meeting, and elected the following officers: J. M. Seay, Lynchburg, president; Leslie Fergus, Farmville, vice-president; Chief Perry, Fredericksburg, second

vice-president; Chief C. A. Hamilton, Roanoke, secretary and treasurer.

The resolution requesting a search and seizure law was opposed by Major Kizer, of Norfolk. The association finally passed a resolution calling the attention of the legislature to the difficulty experienced in enforcing the law, and leaving the matter entirely with the legislature without recommendation of any kind.

League of Wisconsin Municipalities.

The annual convention of the League of Wisconsin Municipalities, which was announced for Aug. 15 to 17, has been postponed until the last week of September. Ford H. MacGregor, Madison, Wis., is Secretary of the league. The program has been modified, and it is expected that ex-President Roosevelt will address the convention.

The Engineering Council.

The formation of an Engineering Council is the outgrowth of a real need for proper consideration of questions of general interest to engineers and to the public, and to provide the means for united action upon questions of common concern. Many such questions have come up in the past and will arise in greater number in the future. This war has brought out very impressively the actual need for united action of some kind. At present the Council is concerned only with four Societies, because that seemed the most practical way of getting a group of men together to answer the immediate needs, but these Societies do not assume to speak for all engineering societies in the country. Criticism that they are exclusive in any way is utterly mistaken. There is the hope that such a Council, by proving itself effectively may lead to much wider cooperation in a strictly representative body for all engineers, and thus pave the way for a very much larger union in the future.

How can the Council be enlarged? By a union of all Societies, either as the outgrowth of the present Council or by a congress of engineers leading to united action by all Societies. The first method will be the most natural one because many local societies and national societies also have a large membership in the four Societies at present concerned. We have three classes of engineers to reach: first, those who are members of local societies and not members of national societies; second, those who are members of national societies and not members of local societies, and third, those who are members of no society. The last named class constitutes a very large number in our profession. We are almost as mixed as American citizenship and we suffer therefrom just as much as America with a population representing every race and every people in Europe. There can be no question of the enormous advantage of union. That union should be completed by strengthening the existing agencies and not by the formation of new societies. The national societies are thoroughly national, notwithstanding an occasional complaint that they are run by New York. If they have not been able to

(*Continued on page 244.*)

PROBLEMS CITIES ARE STUDYING WITH EXPERTS

Miami, Fla., is planning a SEWAGE DISPOSAL system, FILTRATION plant and pumping station. B. H. Klyce, Miami, is engineer.

Defiance, O., is having plans prepared for a WATER PURIFICATION system by the W. J. Sherman Co., Nasby Bldg., Toledo, O.

Lafayette, La., is receiving bids on ten miles of SEWERS and DISPOSAL works. The J. B. McCrary Co., Atlanta, Ga. are the engineers.

For the construction of a POWER plant and additions to the FILTRATION plant and water system, Tulsa, Okla., has called into consultation Stevens & Stiles, engineers, Kansas City, Mo.

Murray, Ia., has been considering the construction of WATERWORKS and SEWERS and consulting on the subject with E. T. Archer & Co., 609 New England building, Kansas City, Mo.

Plans for BRIDGES to be built by Seminole County, Wewoka, Okla., and Garvin County, Wynne Wood, are being made by W. E. Moore, 1006 Campbell building, Oklahoma City, Okla.

Seymour, Ia., is receiving bids for constructing a SEWERAGE system from plans prepared by M. G. Hall, consulting engineer, Centreville, Ia.

Okmulgee Co., Okla., in laying out a county ROAD system, called upon Harrington, Howard & Ash, Orear-Leslie Bldg., Kansas City, Mo. 101 plans, etc.

Bids will soon be received on a WATERWORKS system for Shamrock, Okla. Plans for the improvement have been prepared by the Mackintosh-Walton Co., Oklahoma City, Okla.

In constructing new WATER MAINS and SEWERS, South Milwaukee, Wis., has been consulting with Alvord & Burdick, engineers, 8 So. Dearborn street, Chicago.

For the construction of a complete PUMPING plant in connection with drainage work for the Gregory Drainage District, Gregory Landing, Mo., plans were prepared by the Edmund T. Perkins Engrg. Co., First Natl. Bank Bldg., Chicago, and Illinois State Bank Bldg., Quincy, Ill.

PERSONALS

Davis, Frank R., has joined the designing department of the Bureau of Yards and Docks, Washington, D. C. He was formerly assistant engineer with the Rapid Transit Subway Construction Co.

Kneisel, Arthur, national treasurer for the American Association of Engineers, died in Chicago on August 17, 1917. He was born in Lexington, Ky., in 1880, and received his early education in the Lexington schools, later graduating from the University of Kentucky. He went to Chicago over fifteen years ago and was engaged as a telephone engineer and patent attorney. At the time of his death he was president of the Utilities Development and Sales Company.

Lederer, Arthur, has been appointed director of the State Hygienic Laboratory, Morgantown, W. Va. He was formerly connected with the Chicago Sanitary District.

Nagle, James C., has been appointed dean of engineering and professor of civil engineering in the Agricultural and Mechanical College of Texas, succeeding D. W. Spence, whose death occurred in June. Mr. Nagle is a Virginian by birth, but most of his life has been spent in Texas. He graduated from the University of Texas in 1889 with a B. S. degree in engineering, and obtained an M. A. degree in 1892. In the same year he obtained a C. E. degree from the Western University of Pennsylvania, now the University of Pittsburgh, and in 1893 an M. C. E. degree from Cornell. He was a professor of civil engineering in the Agricultural and Mechanical College of Texas for about twenty years and in 1911 was also made dean of engineering. He resigned from this position in 1913 to become chairman of the Texas board of water engineers, and has occupied that position since then. During his professional career he has often been engaged on construction work of various kinds, principally railroad, bridge and irrigation work. Mr. Nagle is the author of a field manual for railroad engineers and of numerous technical papers. He is a past president of the Texas Association of Members of the American Society of Civil Engineers, past president of the Texas Academy of Science, and a major in the Engineers Reserve Corps.

Shumway, Arthur L., city engineer of Camas, Wash., has left for immediate service in France with the Tenth Engineers.

Vail, E. M., is now in charge of the northern division headquarters officers of the New Jersey state highway department, located at Plainfield.

Van Horn, R. E., who has been connected with the Dayton, O., bureau of sewerage design, is now with the Coventry Land Improvement Co., Akron, O., as assistant engineer.

NEW APPLIANCES

Describing New Machinery, Apparatus, Materials and Methods and Recent Interesting Installations.

OLSEN CONCRETE MIXER.

Double Drum Batch Mixer of Original Design.

The Olsen batch mixer is designed on the principle that concrete should be mixed dry first and then wet without washing the cement off the aggregate in order to get best results. The mixer therefore has two drums, one for mixing dry and the other for wetting.

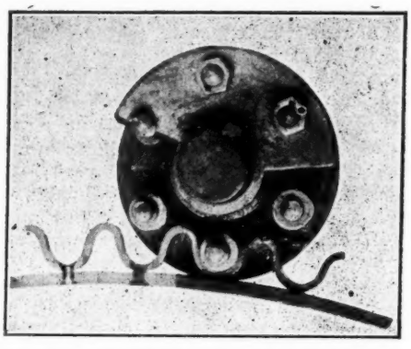
The two drums are securely fastened and revolve together driven by the same driving pinion. The mixing drum is of larger diameter and the wetting drum scatters and mixes the batch more —the proportions being determined by years of actual use. The large mixing drum scatters and mixes the batch more quickly and coats the aggregate with cement and distributes the coarse aggregate through the batch uniformly. As a test of thorough mixing, it is claimed that in two revolutions of the drum five pounds of color and a sack of cement can be mixed to uniform color. In the wetting the batch should not be scattered and for that reason the wetting drum is smaller in diameter.

In the first compartment of the mixing drum specially designed mixing shovels are rigidly fastened to the drum and so placed as to lift, scatter, interchange, reassemble and thoroughly mix the materials. Each mixing shovel carries a certain part of its load to the top and discharges it on the top of the batch when the port is closed. When the port is open the load is discharged on an inclined chute fastened to the wetting side of the port and in this way into the wetting drum, where simultaneously the required amount of water is admitted into the curved pipe which carries the port and transfer chute. The dry mixed concrete and the water enter the wetting drum at the same time, going in the same direction at the same rate of speed. The specially designed shovels in the wetting drum give the batch a rolling motion, always moving the batch towards the discharge end where it accumulates in the wheel barrow loader ready for use.

In operating, the port between the drums being closed, a batch is introduced into the mixing drum. When it is dry mixed to a uniform color, in about one revolution of the drum, the port is opened and the batch is discharged into the wetting drum. The water is admitted to the pipe three or four seconds before the port is opened to give the water time to reach the wetting drum, but about the same time as the concrete. When the batch has been discharged into the wetting drum, the port is closed and another batch is introduced into the mixing drum, and so on. When a batch is discharged from the mixing drum into the wetting drum the preceding batch is discharged from the wetting drum by opening the discharge end with the wheelbarrow loader.

The speed of the mixer is limited only by how fast the operator can mix a batch dry and discharge it into the wetting drum. There is no time lost by the charging crew and the wheeling crew waiting for another, as the charging and discharging of the mixer do not interfere with each other. The double drum mixer can therefore deliver a batch a minute.

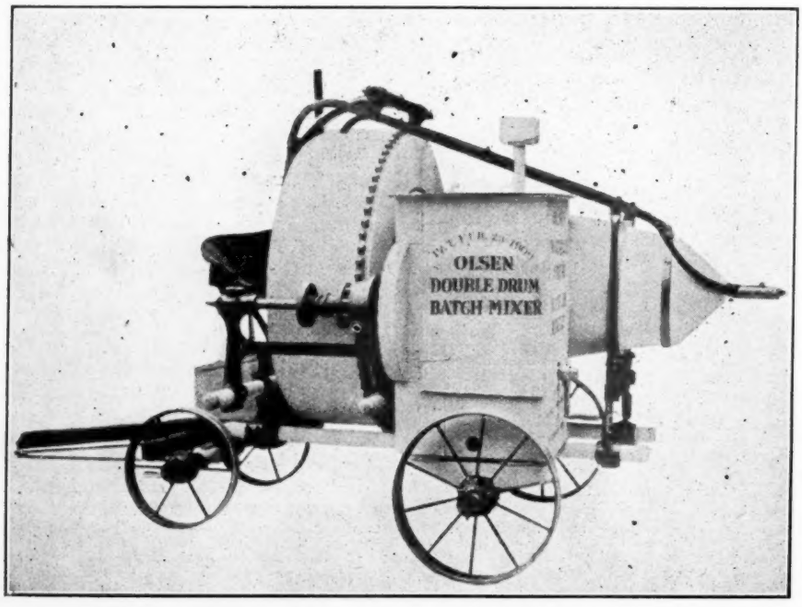
The double drum construction also enables the mixer to have a large low feed opening and a high discharge. Another advantage claimed is the low cost of operation. Portability is still another feature of service. The wide range of the work of the mixer is also important. Concrete may be mixed dry enough for tamping work, such as blocks, tile, etc., and wet enough for pouring with equal facility. The machine, because of the two drum construction, is also very easy to keep clean.



FRICTIONLESS ROLLER PINION DRIVE.
(One wall cut away.)

The machine is specially built for heavy service. A tubular frame is used and axles are made of the same materials, making a very strong combination. The castings are semi-steel and crucible steel where necessary. The drums, wheelbarrow loader and inside cone are of open hearth iron. The heads of the drums are made strong and light, being spun from a sheet of iron. The bearings are of an original saddle type, properly oiled by center well and self-aligning to withstand vibrating wear. The countershaft has large split babbitted bearings. The mixer is equipped with a spur gear from the engine to the countershaft and from the countershaft to the drum with a driving pinion and sprocket. The drive consists of a two-walled pinion between the walls of which is set case-hardened rollers revolving on case-hardened bolts which drive on a large substantial sprocket, the teeth of which are stamped from a strip of steel riveted between each tooth to a steel band. The weight of the batch is distributed over the countershaft as well as the drum bearings.

The closure on the discharge end, or wheelbarrow loader, consists of a stamped steel cone 16 inches in diameter fastened to a steel spindle which has a dust-proof bearing in a forked



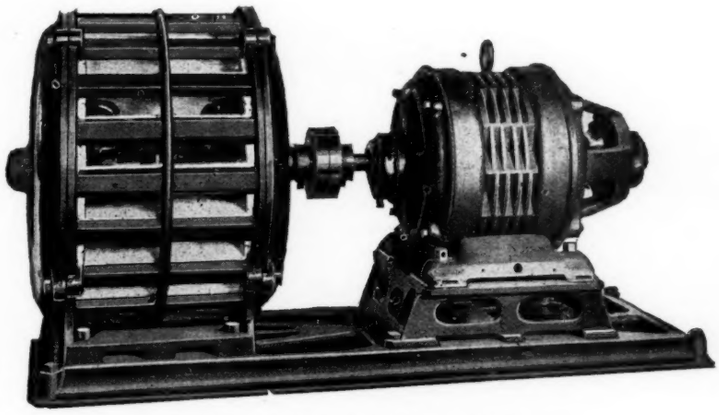
OLSEN NO. 3 DOUBLE DRUM MIXER.

handle and is designed to close against an iron ring on the discharge end of the wetting drum. When this is closed the concrete is discharged into it so that when it is opened the accumulated concrete is instantly discharged. It serves the several purposes of closing the discharge end, accumulating concrete for the next wheelbarrow load, keeping the concrete mixed and proportioned until dropped and excludes air from the wet concrete.

The No. 3 mixer is of the rear discharge type. The mixing drum is 4 feet in diameter and 16 inches across, while the wetting drum is 28 inches in diameter at the large end, straight for 15 inches and tapers to 16 inches at the discharge end—about 4 feet long altogether. This mixer has an easy capacity of seven yards per hour, and can go up to ten. A special feature of this mixer is that the engine is placed on the rear axle adjacent to one of the rear wheels, which has a wider tire. This makes for easy running and protection against dust and dirt.

The No. 2 mixer has an easy capacity of five yards an hour, and goes up to 70 yards per ten-hour day. The No. 1½ has a three-yard per hour capacity. A No. 4 machine is being prepared for the market, which will have a capacity of 20 yards per hour and will be especially adapted to concrete road work. It will be furnished with or without skip.

The accompanying illustrations show a No. 3 mixer and various features of the design and construction of the machine. It is made by the Olsen Concrete Mixer Company, Elkhorn, Wis.



STERLING SIREN FIRE ALARM.

STERLING FIRE ALARM.

Electric Siren Signal for Calling Firemen.

The Sterling siren fire alarm has been developed to meet the demand for a powerful electric signal to replace the fire bell and steam whistle and to obviate the initial expense and maintenance cost of installing a compressed air outfit. The siren note emitted is unusual and distinctive and serves effectively as a fire warning.

Simple construction, few working parts and ample size and strength are the principal features of the Sterling siren. The main part of the siren is naturally the fan or rotor. This is double-faced, made of aluminum and is keyed to a steel shaft which in turn is supported by large end bearings. The Sterling fan is made of aluminum in order to obtain the advantages of reducing the load on the motor and thus adding to the efficiency and flexibility of the outfit. The fan is not carried on the armature shaft of the motor, but is supported by independent end bearings. This construction is designed to eliminate the possibility of the shaft springing and getting out of line and thus allowing the fan to scrape against its housing with the chance of wrecking the whole outfit. The end bearing construction makes for rigidity and reliability. The fan revolves in an iron housing built with properly proportioned air ports—the action of the fan cutting off air at these ports producing the siren sound. The siren and motor are direct-connected and mounted on one base, making a compact and rugged outfit.

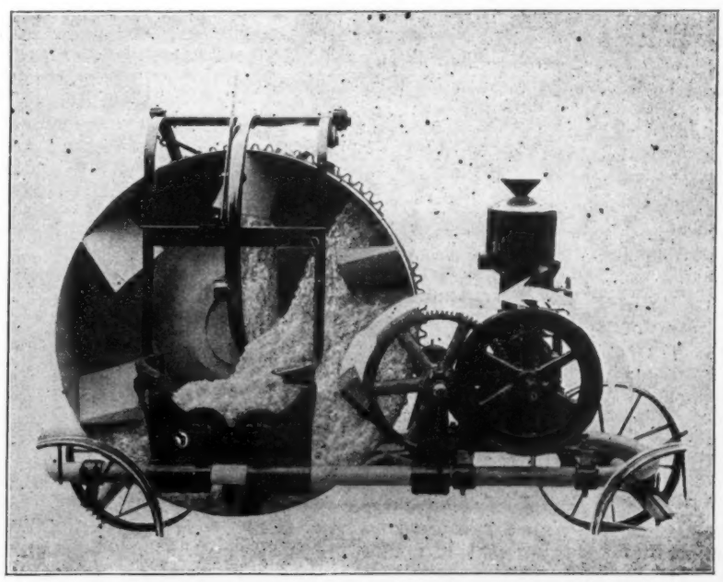
When the switch is thrown in and the motor begins to revolve the fan, the first notes are very deep and heavy, but as the motor gains speed the siren note grows higher and higher, until at maximum speed it is a shrill screech—not so shrill, however, as to lose its power of penetration. As soon as the highest note is reached, the switch is thrown off, allowing the siren note to descend the scale. The note should not be kept stationary for more than a few seconds at a time.

In installing, the siren is best raised about fifty feet from the ground and placed on any firm foundation. Good places are the hose-drying tower of the fire house, in a belfry or on the cross beam of a water tower. The wiring is simple and any electrician can do it in a very short time. The motor is covered with a weatherproof housing. The siren itself is not affected by the weather. The switch controlling the siren can be placed wherever desired and more than one switch can be used. A good location for the switch is in the office of the local telephone exchange, where the alarm can be sounded by the telephone operator when she is notified of a fire. Other switches, covered by neat wooden boxes, can be placed in different sections of the town, each switch being independent.

The outfit is being adopted by small towns to serve as a general fire signal for calling out the volunteer firemen. The accompanying illustration shows the outfit, with the motor housing removed. The alarm is made by the Inter-State Machine Products Company, Rochester, N. Y.

INDUSTRIAL NEWS

Cast Iron Pipe.—The high level of prices is still maintained and this is held to be a reason for inactivity. Government buying is slackening and few



SECTIONAL VIEW OF OLSEN MIXER.

municipal lettings reported. No important buying of private or public nature has been reported. Quotations: Chicago—4-inch, Class B and heavier, $68.50; 6-inch, $65.50. New York—4-inch, Class B and heavier, $68.50; 6-inch, $65.50. Birmingham—4-inch, Class B and heavier, $63; 6-inch, $60; Class A, $1 extra.

The MacArthur Concrete Pile and Construction Co., Jersey City, N. J., has been incorporated for the purpose of constructing foundations and pedestal piles. A. F. and J. H. MacArthur and F. H. Hitchcock, of New York, are the incorporators.

Road Machinery in Spain.—The city of Malaga may be in need of road machinery. The attention of manufacturers of road construction machinery is drawn to the law of February 14, 1907, for the protection of national products. According to this law foreign firms can not submit bids for any machinery of a kind which may be obtained in Spain. Steam rollers are manufactured in Spain, but no gasoline road rollers are made. There are no contractors or business houses in Malaga which handle road-making machinery. American manufacturers should address the Ingeniero de las Obras Publicas in each of the 49 provinces of Spain in Spanish or have an energetic representative canvass the entire peninsula. The official in charge of streets in Spanish cities is "El Ingeniero Municipal." The roads in Malaga province outside the city limits are constructed and maintained by the government. The official in charge of the roads in the province is the Ingeniero de las Obras Publicas, Ministry of Development (Fomenta) in Madrid.

NEWS OF THE SOCIETIES

(*Continued from page* 241.)

express the democratic spirit of our country as fully as might be desired it is the fault of the members in all the states and not of the city in which the principal offices are located.

The four Societies concerned at present are the American Society of Civil Engineers, the American Institute of Mining Engineers, the American Society of Mechanical Engineers and the American Institute of Electrical Engineers. They have come together in pairs from time to time in the past for special purposes and there have been general conferences on subjects requiring immediate settlement, but until the Council was definitely organized in June there was no permanent body to advise all the Societies. We have had many fruitful discussions in the past leading to useful action. The Standardization Committee, which has been organized to represent five Societies, has passed upon commercial standards of all kinds. This Committee has great possibilities and it should be enlarged enough so that its influence may become very widespread.

Many problems have already been presented before the Council. Its personnel, made up of twenty-four men, representing equally the four Societies, is well balanced and judicial. The first duty was necessarily the organization and appointment of standing committees, which have already been reported in the press. They might with advantage be mentioned here:

1.—Committee on Public Affairs comprising of C. W. Baker, G. F. Swain, S. J. Jennings and E. W. Rice.

2.—Committee on Rules, comprising of J. P. Channing, Clemens Herschel, N. A. Carle and D. S. Jacobs.

3.—Committee on Finance, comprising of B. B. Thayer, I. E. Moultrop, Calvert Townley and Alex. C. Humphreys.

Certain questions relate, however, to the war and the assistance that engineers can render. A committee to be called the American Engineering Service committee was appointed, with instructions to invite the cooperation of all engineering societies. This committee, in the first instance, consists of A. D. Flinn, of the Civil Engineers, A. S. McAllister, of the Electrical Engineers, George J. Foran of the Mechanical Engineer, C. G. Stone of the Mining Engineers, and E. B. Sturgis, of the Mining and Metallurgical Engineers. Its present duty is the tabulation and listing of the members of the five Societies represented, in order that we, as a profession, may be in a position to take a large part in the industries after peace is declared. This tabulation has already in part been done, but in a rather unsystematic and unequal way. It is hoped that the new Committee, by having additions from other societies, may make a final and lasting tabulation of all the engineers in the United States. The list is to be kept in the Engineering Building for general use in Government problems and in the industries. At present the Committee is devoting its attention to the immediate need of the hour, namely, the procurement of men for special service in the Government. A list of specialists in the Societies has already been completed. There are three methods by which engineers may enter United States service: first, through some organization; second, through individual application to a department of the Government, and third, through selection by the Conscription Law. But this is War Service wholly and not Civil Service, which is the same now, as it has always been. As a matter of fact, a great many engineers have already entered through the engineering societies, through colleges and through various special boards in Washington. The importance, however, of a complete list of engineers and their professional specialties cannot be overrated. Such a complete list can be made only with the help of the local, as well as of the national, societies. The Committee mentioned above is organized with George J. Foran as Chairman and A. S. McAllister as Secretary. All societies should respond to the request for cooperation.

Another committee, of which Harold W. Buck is Chairman, is called the War Committee of Technical Societies. The members are Messrs. H. W. Buck, A. M. Greene, R. N. Inglis, C. R. Corning, C. C. Stone, D. W. Brunton, J. M. Boyle, J. V. Davies, Joseph Bijur, A. S. McAllister, W. D. Richardson and Charles Baskerville. It was appointed to assist any organization in Washington, such, as for instance, the Council of National Defense, the National Research Council and the Naval Consulting Board, in any way in which it can bring to the attention of the engineers of the country the necessity for thought and help in the numerous problems that arise.

A council organized by the enlargement of the present Engineering Council can be very effective in many ways, without interfering with the autonomy of any individual society. Every society has some definite purpose of its own, and also some which it holds in common with all other societies. One of the latter purposes relates to public service and to cooperation. To the end that all societies may understand fully their opportunity, the Committee, of which Mr. Foran is Chairman, has made a complete list of all the societies and their officers and communications will be sent out inviting cooperation, and it is hoped that the Council may be successful in arousing sufficient interest to bring about a larger and better Council for all engineers.

In organizing the Council provision was made for the election to membership of other national engineering and technical societies. There is no doubt that rules can be made under which these societies may become members. This will involve consultation and discussion in the future.

The office of the Council will be in the Engineering Building, 29 West 39th Street, New York City.

The members of the Engineering Council are as follows: United Engineering Society—Clemens Herschel, B. B. Thayer, I. E. Moultrop, Calvert Townley, Secretary. American Society of Civil Engineers—John F. Stevens, George F. Swain, Vice-Chairman; Fred H. Newell, Alex. C. Humphreys, John D. Galloway. American Institute of Mining Engineers—P. N. Moore, S. J. Jennings, B. B. Lawrence, J. Parke Channing, Edwin Ludlow. American Society of Mechanical Engineers—Dr. Ira N. Hollis, Chairman; John H. Barr, Charles Whiting Baker, Arthur M. Greene, Jr., Dr. D. S. Jacobus. American Institute of Electrical Engineers—H. W. Buck, Vice-Chairman; E. W. Rice, N. A. Carle, P. Junkersfeld, C. E. Skinner.